Assessment: Course Four Column

FALL 2016

El Camino: Course SLOs (MATH) - Math (Math and Science Majors)

ECC: MATH 170:Trigonometry

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate basic trigonometric concepts and definitions. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Right Triangle Trigonometry - A student stands 20 feet from the base of a tree and looks up at the top of a tree with an angle of elevation of 60 degrees. Find the height of the tree. **Standard and Target for Success:** Our target goal for success on SLO #1 is that 70% of the students will score a 2 or a 3 based on the following rubric: 0 –No understanding (no relevant math) 1 –Some understanding (label, or sketch, or some correct equation) 2 –Most understanding (all from 1 and solve) 3- Complete understanding (all from 1 and 2 and round and state answer) **Additional Information:**	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Met Here are the results from assessing a total of 214 students from 7 sections (0832, 0834, 0836, 0840, 0842, 0844, 0846): 157 students or 73.3% scored a "3" 22 students or 10.3% scored a "2" 19 students or 8.9% scored a "1" 16 students or 7.5% scored a "0" This mean a total number of 179 students out of 214 students passed the SLO #1. Therefore, the success rate for SLO #1 in FA 2014 is 84%. Here are some comments from instructors participating in the assessment of this SLO: Since 28 students scored a 2 or 3, the success rate was 74%. My expectation was a success rate of 75%, which is close to what was achieved. The problem that was used for this SLO was an application problem, which resulted in a number of students who scored 0 or 1, hardly attempting it. The next time that this SLO is assessed, with this type of application problem, I plan to introduce the topic with students attempting the problem at their desks, in collaboration with their classmates. The difficulty with the trigonometry course is that there are too many mandatory topics to be covered, with insufficient time available. This hinders the	**Action:** Since 84% of the students did very well on this SLO, next time we will increase the rigor of the application problem. (12/07/2018) **Action Category:** SLO/PLO Assessment Process

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		use of much collaborative work. One student couldn't get the diagram right. That means he's not sure what an angle of elevation is. Another student got the diagram, yet he didn't continue working on it to find the height. Another student also got the diagram right, yet she made a mistake on definition II for cosine when finding the height. (With the given information, simply she's supposed to use tangent.) And, the rest of the students made no mistakes. The students didn't meet my expectation since my target success rate of at least 90% was not met. In lecture, I walked the students through several examples on angle of elevation, and used definition II for trigonometric functions to solve the problems. The examples are from exercises (even problems) in the textbook. I assigned them odd problems that are comparably difficult. I wrote exams that reflected materials gone over in class. I put this SLO question on the final exam. I also did a review before the final. For the review, I went over elevation angle and definition II-related problem. Those who showed up for the review scored 100% on this SLO question. Those who didn't show up and didn't take the class seriously did poorly on it. To improve the result, I'll do more application problems involving in angle of elevation and definition II in class, assign more homework problems, write the students practice exam questions, and encourage the students to come for the exam review. I am pleased with the SLO results. This class is one of the weakest classes I have had in some time and I expect that many of them will not pass the class, so I am not concerned that 30% of them did not pass the SLO. If they want to succeed in trigonometry, I am confident that most of those 30% will repeat the class and have a second chance at learning this skill along with several other skills they are currently missing.	

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		Overall, my students did very well on this question. The majority of them drew a picture or diagram to help them better understand the question. This shows me that my use of diagrams on questions solved during class was very beneficial for my students. Somewhat interesting is the fact that the students were divided into two camps for solving the question with roughly half approaching it as a right triangle and using the tangent function while the other half approached it using the more advanced technique of the law of sines. This shows that students were able to choose a method that they were comfortable with when faced with a problem. In the future, I will keep with the same approach and hopefully achieve similar results. Students met my expectations on this SLO. I also had the students draw a picture to increase the understanding of the question being asked. (01/29/2015) **% of Success for this SLO:** **Faculty Assessment Leader:** Gregory Fry **Faculty Contributing to Assessment:** S. Tummers, M. Georgevich, B. Mitchell, T. Meyer, R. Heng	
SLO #2 SOLVING PROBLEMS - Students will solve trigonometric application problems, including those involving the laws of sines and cosines. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Bo is ahead of Al in a marathon race as they approach the finish line. A news helicopter hovers 1700 feet directly above the finish line. If the angle of elevation from Al to the helicopter is 38 degrees and the angle of elevation from Bo to the helicopter is 45 degrees, then (a) how far is Bo from the finish line? and (b) how far apart are the runners from each other? **Standard and Target for Success:** Our target for success is 70% with this problem (that is, passing score	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met We assessed 10 sections of math 170 this semester. A total of 241 students were assessed. We summarize the results as follows: Score of 3: 127 out of 241 students (that is 52.7%) Score of 2: 53 out of 241 students (that is 22%) Score of 1: 33 out of 241 students (that is 13.7%) Score of 0: 28 out of 241 students (that is 11.6%) Overall, we are pleased with the results. We saw a 74.7% rate of success (scoring 2 or 3). Our target for success for this SLO is met.	**Action:** Since we met our standard for success, we would like to follow up using a trigonometry problem that utilizes a different skill set and/or increase the rigor of the assessed problem. (01/16/2017) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** Instructor input regarding a slightly different problem reveals that students still can benefit from stronger understanding of the law of sines and cosines. Using angles of

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	of 2 or 3 on the following rubric scale: 3 – Complete Understanding – Students solve both parts of the problem correctly and showing appropriate computations. 2 – Most Understanding – Students solve at least one part of the problem correctly. Minor computational errors in trigonometry might be present. Essentially the problem solving process is on track. 1 – Some understanding – While there is an attempt at utilizing appropriate trigonometry to solve the problem (perhaps the student was able to draw an appropriate sketch), solid understanding is clearly not present. Student might be attempting to apply incorrect trigonometric functions for example or implementing them incorrectly. 0 – No understanding – There is little evidence of any understanding of the topic. The problem is left practically blank (or has nothing of value written). **Additional Information:**	---------- Overall Analysis of Results: Overall we saw good results assessing students' ability to analyze an application problem using trigonometry. Techniques that seem to help include training students to sketch appropriate diagrams and having students work on exercises collaboratively and on the board. To improve these results, we will continue to suggest instructors emphasize conceptual understanding of the mathematical ideas as well as the computational procedures. Important terminology such as 'angle of depression' or 'angle of elevation' cannot be treated lightly. These terms in conjunction with application problems will help our students improve their performance. ---------- Instructor Comments: We summarize some instructor comments on their individual class results here: Students had a hard time drawing/labeling the picture. Students had difficulty drawing and labeling the diagram. Results were very good because students were prepared for this type of question on the final exam. Students practiced word problems in class and on homework. To improve results, next time I will assign variety of similar word problems. The students did not meet my expectation, since the success rate was 68%. A helpful method was having students solve problems at their desks. Next time, I will try having students work the problems in pairs and discuss the solution process with each other.	elevation / depression, students still seem to have difficulty with sketching an appropriate diagram and applying the appropriate law of sines/cosines formula. One instructor reports a 65% success rate using the laws of sines and cosines in a recent exam (with more challenging problems than previously assessed). (10/15/2017)

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		The SLO question was on a quiz. The diagram was not provided. Students missed the problem if they did not have the right diagram. This was a result of understanding or not understanding the terms “angles of elevation” or “depression”. Once they had the diagram right, most if not all of the students had problem was right. I’ll give students more opportunity to work problems themselves, instead of taking notes from the board. I put this SLO question on the final exam. I expected 80% of the class completely got the problem right, yet 75% of them got it correct. This result is not that bad. To help prepare the students for this SLO, I assigned them homework problems, used a similar problem as an example in lecture, put a similar problem on one of the exams (Exam #3), and put a similar problem on the practice final and I went over that similar problem during the final review. Some students remembered the formula wrong. Some used Definition II for trigonometric functions with an oblique triangle. To improve the results in the future, I have to encourage the students to memorize the Definition II for trigonometric functions. In fact, I have reminded the students several times that Definition II can be used only for a right triangle. In the future, I have to remind them more often that Definition II cannot be used with an oblique triangle. Some didn’t set their calculators to degree mode when evaluating tan(45 degrees), for example. Most of the students have a good understanding of right triangle trigonometry. I have given similar right angle triangle questions at the beginning of the semester, and also similar triangle questions (not necessarily right angle) in chapter 7 using the laws of sines, and most of the students did well on that. Just the traditional lecture method. We did a lots of	

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		problems from the exercise in the text book. I will push my students to practice more. (01/16/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** G Fry **Faculty Contributing to Assessment:** Pham, Numrich, Georgevich, Eldanaf, Avakyan, Heng, Dammena	
SLO #3 GRAPHS - Students will create, interpret and analyze the graphs of trigonometric functions and their inverses. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2016-17 (Fall 2016) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Consider the following function: f(x)=3 sin ((1/2) x + pi/2) a) Identify the period, amplitude, and horizontal shift of the function. b) Sketch one complete cycle of the curve. Be sure to clearly label your axes appropriately. **Standard and Target for Success:** Our target for success is 65% (that is, at least 65% of all assessed students earning a score of 2 or 3 as indicated by the rubric below. Scoring Rubric: 3 – Student demonstrates complete understanding of the function's graph. Part a) is all correct. Axes are labeled clearly (roots clearly shown) with proper amplitude. 2- Most understanding is present. Perhaps the student made an error identifying one of the amplitude, period, horizontal shift, etc… (or graph exhibited one of these errors).	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met We assessed 9 sections of Math 170 this semester. 299 students total were assessed. Score of 3: 116 (39%) Score of 2: 92 (31%) Score of 1: 73 (24%) Score of 0: 18 (6%) Success rate (scoring 2 or 3): 70% Our target is met with 70% of students scoring a 2 or 3 on the Math 170 assessment. Overall analysis summary: Instructors commented in general that students responded well to practice problems completed in class and reviewing the nuances of function transformations from previous algebra courses. Some also commented on using applied examples such as sound waves or the rise and fall of tides to illustrate graphical properties of trigonometric functions. Overall, we were quite pleased with the results. Some instructors suggested the number of units in the course be raised to 4.0 to accommodate the large number of topics assessed in the course. A sampling of specific instructor comments: A. Martinez: I walked them through the concepts one at a time, first graphing sine and cosine, then the changes with	**Action:** With a fairly high success rate observed in Fall 2016, we would like to change the nature of the assessment for graphical understanding of trigonometric functions to be more challenging and/or require deeper thinking. Perhaps an application problem or graphing problem involving all transforms, reflections, compressions, etc... (02/04/2019) **Action Category:** Curriculum Changes

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	1 – Several errors are present (but perhaps the shape is still correct). Several errors in correctly identifying the period, amplitude, shift/phase etc… are present (either computationally and/or graphically) 0 –Hardly Anything. Graph is completely off-base (wrong shape) and no evidence of any understanding is there.	amplitude, then with phase changes. I had them graph quite a few of these before moving on. For phase changes I showed a way to make the phase change easier to draw by not actually changing the graph, just changing the axis. Then in a different class period we covered calculating phase shift and amplitude from an already drawn graph. I think this helps students get a better idea because they have to think the other direction. Finally I introduced the horizontal and vertical shifts by showing them how these just change their already calculated coordinates by adding or subtracting from the x and y parts of the coordinates.	
	Additional Information:	J. Kasabian: This class did meet the expectations for the SLO. For the 19 students earning a score of 3, they were able to correctly report the period, amplitude, direction change (if any), horizontal shift (if any), and vertical shift (if any) for the graph. They were also able to correctly label the axes and graph one period of graph. For the students earning a score of 2, they were able to identity some of the components of the graph (period, amplitude, direction change, horizontal and vertical shifts) but were able to correctly complete the graph with their incorrect identifiers. During class, we spent time identifying the components of the graph [period, amplitude, direction change (if any), horizontal shift (if any), and vertical shift (if any)] before we worked on graphing the function. We also had students show their graphs and explain their work once it was completed and the doc cam is ideal for this. We did practice, practice, and then more practice! The assessment was by way of a one problem quiz. I might have students write the equation of a function (given some parameters) and solve their problem. Then ask students to switch papers and have another student complete the problem and then they can check their answers to see if they match. If not, they have to identify where the error(s) are located and in whose solution. M. Georgevich: Those students who succeeded, knew how to draw the basic graphs of the sine and cosine functions. Teaching and stressing that repeatedly, helped the students	

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		who practiced sketching these basic graphs. Obviously the teaching methods weren't successful for all of the students, since the success rate was only 56%. Math 170 (Trigonometry) is packed with too much material for a course allotted just 3 units. If there were sufficient time, students could work in pairs at their desks in sketching and discussing the graphs of Trigonometric functions. S. Tummers: Some teaching techniques that were helpful: My slower pace, my guided notes and the fact that I have 45 minutes prior to every class (class begins at 7:45am OR 9:30am, but I open the classroom at 7:00 am) for students to gather and complete work in groups or with my assistance to help students breakdown each transformational part of the graphs. As stated above, I believe more spiraling of the content along with a few more activities as a way to enable students to gain a greater understanding of the material. (02/04/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Z. Marks **Faculty Contributing to Assessment:** A. Martinez, B. Horvath, J. Kasabian, K. Numrich, M. Georgevich, R. Heng, V. Avakyan	
SLO #4 PROOFS - Students will analyze and construct proofs of trigonometric identities. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2017-18 (Fall 2017) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**			

ECC: MATH 180:Pre-Calculus

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate basic precalculus concepts by solving equations, inequalities and systems involving algebraic, exponential, logarithmic, trigonometric, and absolute value expressions. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Test Question: Given the polynomial function: P(x)=x^4-2x^3-2x^2-2x-3 A) List all possible rational zeros of P(x) using Rational Zeros Theorem. B) Find all zeros of polynomial .Whenever appropriate, use quadratic formula or other factoring techniques. Alternate Test Question (used by only one section): Given the polynomial function: g(x)=12x^3+2?8x?^2+17x+3 A) List all possible rational zeros of P(x) using the Rational Zeros Theorem. B) Use Synthetic Division to determine exactly one rational root. C) Use previous methods to determine the remaining roots. D) Clearly state all of the roots. **Standard and Target for Success:** This SLO was not previously tested under the old SLO Structure. So our goal this semester is that 70% of these students will score a "2" or a "3" on this SLO using the following rubric: Category 0 –No understanding (incorrect answers to part A and B) 1 –Some understanding (correct answer to part A only) 2 –Most understanding (answer to both parts with some computational	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Met There are 11 sections, totaling of 334 students in math 180 that participated in SLO#1 during Fall 2014. The distribution of scores is the following: 47.3% (158 students) scored a “3” , 36.0% (120 students) scored a “2”, 9% (30 students) scored a “1”, and 7.7% (26 students) scored a “0”. The overall success rate is 83.3% and 16.7% did not pass. Section: 0874: ANALYSIS: The students did well with part (A) since the method for listing the possible zeroes is in the SLO. They also had ample practice with this method. For part (B), about half of the students were only able to find the rational roots, and either erred in finding the complex roots or forgot them completely. I think more examples in class may help with remembering to find all zeroes instead of just the rational zeroes. Section: 0876: ANALYSIS: Since 92% of the students scored a 2 or 3, which corresponds to being successful, my expectations of their performance were considerably exceeded. Only 8% of the students, namely 3 of them, scored a 0 or 1, and thus, were unsuccessful. When presenting this topic, I had students work a number of problems at their desks, in collaboration with their classmates. Section: 0884: ANALYSIS: These results did not meet my expectations. I put a similar problem on the 3 exams they had during the semester. We even reviewed this type of problem during the last class meeting. However, I did not give them a 3 if they wrote their answer in factored form. Also, a few	**Action:** Overall, the students did pretty well in finding the zeros of polynomial functions. Next time, we want to increase the rigor of the SLO by using harder functions such as trigonometric, logarithmical or exponential. (11/30/2018) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** We did use exponential functions in the next SLO test question, and it worked out pretty well as about 76% of students were able to obtain a score of 2 or higher. Students seem ready for the increase in rigor. (01/15/2016)

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	mistakes) 3- Complete understanding (correct answer to part A and B with no mistakes) **Additional Information:** **Related Documents:** Math 180,summary ,fall 2014.docx	students made very tiny errors in writing their final answers such as writing 1 instead of -1 even though their work shows -1. I did not give them a 3 as well. I think maybe next time I will also add problems related to the SLO in their homework throughout the semester so they don't forget how to do the problem. Section: 0880: ANALYSIS: The results exceeded my expectations. The results are from the final exam. I put a similar question on every exam throughout the semester making it the fourth time they have seen a similar problem. During the last class meeting I showed the stats of the first set of results and the third set of results to the class and voiced my expectations/goals for that type of question on the final exam. I encouraged them to at least move up one level and that I would like to see 20 score in level 3. I think these results are much better also because students that were failing did not bother to show up for the final (a total of 5), in which case they would be similar to previous results. Section: 0866: No comments Section: 0864: No comments Section: 0862: ANALYSIS: I'm satisfied with my student's results; 80% earned a '2' or '3. This was a good question. Student's responded well to the use of Ti-84 calculators to double check their results. Section: 0870: ANALYSIS: Overall the result is good since 83% of the students scored a 2 or 3. What worked: I went over this concept for 3 hours in class, which correspond to sections 3.3, 3.4 and 3.5, a study guide was given to practice for the test, and I did three problems	

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		similar to the SLO question during the review session the day before the test. Even though 83% is a very good passing rate but to increase that , next time I will warn the students on reading and working the problems on study guide carefully and assigned extra problems on the study guide for them to practice at home. Section: 0860: ANALYSIS: 61% of the students scored a 2 or 3. Although I went over this concept for 3 hours in class, which correspond to sections 3.3, 3.4 and 3.5, a study guide was given to practice for the test, and I did three problems similar to the SLO question during the review session the day before the test, the results were not as I expected. I am teaching two sections of math 180 this semester .This class meets at 7:00AM with passing rate of 61% and the other class meets at 11:30am with the passing rate of 83%. Next time, I will warn the students on reading and working the problems on study guide carefully and assigned extra problems on the study guide for them to practice at home, but still the main cause of this low passing rate is the early morning time of class. The students that are taking their classes so early usually leave the campus to go to their work and do not spend enough time on their studying, so I don't see how I can improve their success rate if they are not willing to do their part. Section: 0872: ANALYSIS: Most students were able to answer part A correctly. Many only found the real roots, so they were given a score of "2." This was one of the last topics taught before the test, and students probably needed more time to completely master this material. What worked: Going over the big picture of graphing the function – knowing end behaviors and the shape of the graph. Then covering Rational Roots Theorem and Descartes Rule of Signs, to help locate real zeros. What didn't work so well: Focusing too much on graphing the function led to students stopping when they had all the	

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		Real roots. I needed to emphasize the need to find imaginary roots too. Section: 0882: In order to have more students score 2 or higher I need to spend more minutes teaching this concept to students. I will give students more practice problems for homework. I will also have students explain this concept to each other in class. (01/15/2015) **% of Success for this SLO:** **Faculty Assessment Leader:** Aban Seyedin **Faculty Contributing to Assessment:** A. Seyedin, E. Barajas, J. Epstein, A. Hockman, M. Mata, M. Geogevich, M. Cortrz, A. Adalinda	
SLO #2 SOLVING PROBLEMS - Students will use polynomial, rational, exponential, logarithmic, and trigonometric equations and functions to set up and solve application and modeling problems. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** A biologist finds that there is an initial bacteria count of 600 in a culture. The relative rate of growth of the bacteria is 30% per hour. (a) Find a function that models the number of bacteria after t hours. (b) What will the bacteria count be after 8 hours? (Round to the nearest whole number.) (c) How many hours will it take for the bacteria count to reach 50,000? (Round to the nearest tenth of an hour.)	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met There were 8 sections assessing this SLO during Fall 2015. A total of 231 students participated in this SLO assessment. The distribution of scores is as follows: 13.4% earning score of 0 (31 students), 10.4% earning score of 1 (21 students), 18.2% earning score of 2 (42 students), 58.0% earning score of 3 (134 students). The overall success rate is 76.2% (176 students earning a score of 2 or 3). We successfully achieved out target percentage for success. Sec 0874 Since there were 28 students who scored 2 or 3, the success rate was approximately 87%, which is very good. The	**Action:** We will try to continue having students work in class on these problems, give some handouts, and hold more review sessions. (01/15/2017) **Action Category:** Teaching Strategies **Follow-Up:** We have worked out exponential equation problems more in class in groups and individually. We are also focusing more on these functions during reviews for exams. It is a strategy that we will continue with use with our other SLOS. (01/27/2017)

Course SLOs	Assessment Method Description	Results	Actions
	Standard and Target for Success: Our goal this semester is that 70% of these students will score a 2 or a 3 on this SLO using the following rubric: Students will receive a score of 0 - 3 based on the following. Score of 3: Answers all three parts correctly Score of 2: Answers two parts correctly Score of 1: Answers one part correctly Score of 0: Answers no part correctly **Additional Information:** All reported results came from the suggested question.	students exceeded my expectation for their success. I had students work on problems of this type in pairs during class time, in addition to assigning such problems for homework. This proved to be effective, along with having a motivated group of students in the class. Since an 87% success rate will probably not be exceeded, I will assign a more challenging problem the next time that I teach this course. For this assessment, I used the problem that was given. Sec 0862 Most students obtained a score of 2 or 3, so I am pretty happy with the results. I think letting students do practice questions on exponential functions in class was very helpful. I may also ask students to create a problem next time I teach this class. If they can do that, I truly believe that they have learned this topic well. Sec 0860 1. Over half of the students earned a 3 or a 2, but that leaves almost half of the students doing poorly. 2. I went through several examples in class. 3. In the future I may develop a handout on this topic. Sec 0864 Most students (70.4%)completed this SLO with good understanding. I think that the results could be higher. Exposure to a few more questions of this type would probably be what is needed to bring along those who had shaky understanding. I suspect some are still not sure from reading the question that an exponential model is what is needed here. That would be the emphasis I would place in this next time I teach it. It is rather surprising to me that, since this is a topic that is covered in the pre-requisite class, that a heavier exposure is needed in Math 180, but there it is! One technique I like using for the modeling portion of exponential is to have the students discover the commonality between the financial model for continuous compounding of interest and the relative rate of growth model. Sec 0866	

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		Most students (72.1%)completed this SLO with good understanding. I think that the results could be higher. The students with some understanding could probably be nudged into complete understanding fairly painlessly. Exposure to a few more questions of this type would probably be what is needed to bring along those who had shaky understanding. I suspect some are still not sure from reading the question that an exponential model is what is needed here. Reading for understanding would be the emphasis I would place in this next time I teach it. It is rather surprising to me that, since this is a topic that is covered in the pre-requisite class, that a heavier exposure is needed in Math 180, but there it is! One technique I like using for the modeling portion of exponential is to have the students discover the commonality between the financial model for continuous compounding of interest and the relative rate of growth model. Sec 0882 Students met my expectations on this SLO. Students used academic discourse while teaching each other. Next time I will continue to encourage students to communicate the process of the solution with each other. Sec 0870 My students beyond my expectation for this SLO. During the review, someone asked a very similar question and I think that helped. I went over any problem that they wanted me to on the day of the review. Many came to my review sessions and that also helped. Next time, I will hold even more review sessions. Sec 0872 Some of my students did, but some of them didn't meet my expectation since they don't like world problems. I used webcam, online webassign homework, group work to help in my classroom. I will try mymathlab next semester to see if the results will be improve or not.	

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		Overall, the students who participated in this SLO assessment showed that they understood solving application problems fairly well by reaching and surpassing our targeted success rate (70%). As some professors note, having students work on problems in class, whether in groups or alone, was very helpful. Using this strategy, as well as giving handouts and holding more review sessions will hopefully raise the percentage of students scoring 2 or above in the next assessment for this SLO. (01/15/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** Jasmine Ng **Faculty Contributing to Assessment:** J. Ng, M. Georgevich, S. Bickford, A. Avila, N. Koch, C. Huang, B. Lewis	
SLO #3 GRAPHS - Students will create, interpret and analyze the graphs of polynomial, rational, exponential, logarithmic, trigonometric, parametric, polar and conic equations. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2016-17 (Fall 2016) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Test Question: Consider the parametric equations. x=2 cos?t, y=3 sin?t Sketch the curve represented by the equations. Use arrows to indicate the direction of the curve as t increases. Find a rectangular-coordinate equation for the curve. Alternate Test Question (used by one section): Given the function: y=1+2 cos?((1/2 x-p/2)) A) Find amplitude B) Find phase shift C) Find period D) Graph the function for one cycle (label the five key points	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met There were 9 sections assessing this SLO during Fall 2016. A total of 200 students participated in this SLO assessment. The distribution of scores is as follows: 14.5% earning score of 0 (29 students), 15% earning score of 1 (30 students), 31% earning score of 2 (62 students), 39.5% earning score of 3 (79 students). The overall success rate is 70.5% (141 students earning a score of 2 or 3). We successfully achieved out target percentage for success. Here are some comments from the professors. Sec 0874 The students did not meet my expectations, since only 63% (17 out of 27) of them scored a 2 or 3 and thus were successful. One of the reasons that the success rate was low, was because the problem involved trigonometry. Though we had practiced solving parametric equation problems of this type in class and on homework, students frequently stumble, when faced with even basic	**Action:** Spend more time reviewing parametric equations before exams and handout more review material for parametric equations. (01/26/2018) **Action Category:** Teaching Strategies

Course SLOs	Assessment Method Description	Results	Actions
	on the graph) **Standard and Target for Success:** Our goal this semester is that 70% of these students will score a 2 or a 3 on this SLO using the following rubric: Test Question: Score of 3: all three of the following are correct: shape of the graph, arrow orientation, rectangular equation Score of 2: two of the following are correct: shape of the graph, arrow orientation, rectangular equation Score of 1: one of the following is correct: shape of the graph, arrow orientation, rectangular equation Score of 0: none of the following is correct: shape of the graph, arrow orientation, rectangular equation Alternate Test Question: Score of 3: Got A,B,C,D Score of 2: Got A,B,C,D with minor mistake Score of 1: Got A,B,C but not the graph Score of 0: Got none of A,B,C,D **Additional Information:** All sections used the Test Question, but one (087 A. Seyedin). Two sections did not submit data: 0876- A. Sheynshteyn and 0880 - R. Taylor.	trigonometric functions. The teaching methods of solving problems of this type in class and assigning this type of problem for homework were particularly effective for those students who were paying attention in class and completing their homework assignments. Those students who were not successful, either did not do the homework, or solved a minimal number of problems, avoiding the parametric equations that involved trigonometric functions. If there was more time or if there were fewer topics in the course, students could solve this type of problem in pairs in class at their desks. Explaining and discussing such a problem with a classmate would certainly enhance the understanding of both the concept and solution of parametric equation problems. Sec 0862 No students did not meet expectations. Less than 70% of students who took the final exam had a good understanding of this SLO. The Final Exam contained a repeated problem type from a midterm exam, and I told students to study the problem type from the previous exam. To improve student learning of this SLO I would create a worksheet for students to do in class in preparation for the final exam. Sec 0860 Most students obtained a score of 2 or 3, so I am pretty happy with the results. I think letting students do practice questions on parametric equations in class was very helpful. I may also ask students to create a problem next time I teach this class. If they can do that, I truly believe that they have learned this topic well. Sec 0866 The results were in line with students' performance in the class. I was expecting somewhat better results. Showing steps to solve problems converting polar to rectangular coordinates. Then using analogy of t as time, to show the movement along the graph. Taking a problem and going from rectangular to Polar and back to Rectangular, graphing	

Course SLOs	Assessment Method Description	Results	Actions
		both ways might be easier. Students do have problems in understanding polar coordinates. Sec 0882 Never having taught this class at ECC, and not having taught it since the 20th century at CSULB, I didn't really have any expectations, so I cannot answer this question. Telling students that there will be a question on the next exam concerning it, as well as telling them that it's important in Calculus II and III. Possibly it could be taught more intensively by eliminating the chapter on matrices. Matrices aren't necessary for any of the first three semesters of calculus. Although they do need determinants in Calculus III, these can be taught from a manipulational standpoint.Byy the time they do need them in differential equations and linear algebra, they're much more sophisticated mathematically. Sec 0872 15 out of 25 students (60%) demonstrated at least a decent level of understanding. This does not meet my standards of success on this SLO. Given the amount of material in Math 180, the time spent in class on parametric equations was relatively brief, although a handful of examples were presented, homework was assigned and assessed, and review material was distributed prior to the exam. Some students may have chosen to spend more time studying other exam topics such as matrices and polar graphs. Providing additional review material and practice prior to the exam likely helped with this SLO for students who participated in the review. Maintaining more focus on the specific SLO should help to improve results in the future. Overall, the students who participated in this SLO assessment showed that they understood graphing parametric functions fairly well by reaching our targeted success rate (70%). As some professors note, practcing these problems in class a lot helped students understand it better. Using this strategy, as well as giving handouts and	

Course SLOs	Assessment Method Description	Results	Actions
		spending more time reviewing this difficult topic before a test will hopefully raise the percentage of students scoring 2 or above in the next assessment for this SLO. (01/27/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Jasmine Ng **Faculty Contributing to Assessment:** M. Georgevich, J. Ng, A. Seyedin, A. Avila, D. Fanelli, R. Reece, J. Stein, K. Numerich, P. Nagpal	
SLO #4 PROOFS - Students will analyze and construct proofs, including proofs by induction. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2017-18 (Fall 2017) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** In Math 180, students will prove trigonometric identities using the sum, difference, double-angle, and half-angle formulas Sample Test Question: Prove sin(x+y)-sin(x-y)=2cosx*siny **Standard and Target for Success:** Based on the rubric given below, it is anticipated that 70 % of the students will score either satisfactory or excellent. * Numbers of Students Excellent (Strong understanding of concept and strong computational skill); Satisfactory (Medium understanding of concept and medium computational skill); Unsatisfactory (Weak understanding of concept and weak computational skill); **Additional Information:**	**Semester and Year Assessment Conducted:** 2013-14 (Fall 2013) **Standard Met? :** Standard Met Our data is collected from 10 Math 180 sections with a total of 254 students. Here is the breakdown: 121 students received a score of "Excellent" = 48%; 71 students received a score of "Satisfactory" = 28%; 62 students received a score of "Unsatisfactory" = 24%; Therefore, 76% of the students passed this SLO #4. We are pleased that this met our goal of achieving 70% success rate. Here are some comments collected from participating Math 180 instructors on why they were successful on this SLO: 1) Most students were able to do this problem easily. Four students left it blank. These students have very weak background in trigonometry. They either have algebra & trigonometry together in high school or never had trigonometry. 2) Students completed all of the homework problems on time before I tested them on this SLO. 3) Students were given time in class and at home to practice problems similar to the SLO problem. 4) Overall the results were pretty good. I plan on spending more class time working with the identities at various levels of difficulty. I think students need more practice in proving formulas and more homework problems in the trig sections. 5) Students did very well in constructing proofs. Two	**Action:** Move some of the trig sections to earlier in the course rather than the middle. So students can have more time understanding trig. (01/25/2018) **Action Category:** Teaching Strategies **Action:** We'd like to increase the target success rate to 72%. (01/25/2018) **Action Category:** SLO/PLO Assessment Process

Course SLOs	Assessment Method Description	Results	Actions
		questions were given, one proof with the relevant sum, difference, double-angle, and half-angle formulas, and one to see if they remember a particular formula. As seen in the results, many students did well on this, despite it having been several weeks since we had done this material. Those who did Satisfactory didn't do well on the question without the relevant formula provided. 6) The scores were so low not because my students were unable to construct a trigonometric proof, but because they did not know the relevant 1/2 angle/double angle/angle addition/subtraction formulae that were necessary to the correct solution of the proof. I think that if the problem had been open book they would have done better. Thus, I do not think this actually measured the topic of the SLO (except that knowing the formulae/identities is pretty much necessary for any trig. proof). 7) Overall the results were pretty good. I spent a lot of time working with the identities at various levels of difficulty. 8)Two questions were given, one proof with the relevant sum, difference, double-angle, and half-angle formulas, and one to see if they remember a particular formula. As seen in the results, many students did well on this, despite it having been several weeks since we had done this material. Those who did Satisfactory didn't do well on the question without the relevant formula provided. (01/25/2014) **% of Success for this SLO:** **Faculty Assessment Leader:** Michael Bateman and Greg Fry **Faculty Contributing to Assessment:** Seyedin, Numrich, Evensizer, Bateman, Silva, George, Mediza, Barajas (2 sections) and Hoang. Shane Smith did not participate in this SLO. **Related Documents:** Bateman's -SUMMARY of Math 180 SLO-5 Fall 2013.docx	

ECC: MATH 190:Single Variable Calculus and Analytical Geometry I

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate the idea of the limit, the derivative and the integral. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Test Question: Show that if f(x)=-x^2+4, then f'(-1)=2 by using the limit definition of the derivative. (That is, by using the difference quotient). Alternate test question: Find the value of f'(x) given f(x)=2/(x^2 + 5) using the limit definition of the derivative. (That is, by using the difference quotient). **Standard and Target for Success:** This SLO was not previously tested under the old SLO structure. So our goal this semester is that 70% of these students will score a '2' or a '3' on this SLO using the following rubric: Category: 0- No understanding (problem is left blank or work shows little indication of conceptual understanding of the difference quotient). 1- Some understanding (students may identify the proper definition of the difference quotient but applying the definition to the given function was unsuccessful. Little conceptual understanding of the difference quotient limit is evident.) 2- Most understanding (the	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Met 1/22/2015 – There were 10 sections assessing this SLO during Fall 2014. The distribution of scores is as follows: 7.4% earning score of 0 (23 students), 13.4% earning score of 1 (42 students), 25% of students earning a score of 2 (78 students) and 54.2% of students earning a score of 3 (169) students. The overall success rate is 79.2% (students earning a score of 2 or 3). We successfully achieve our target percentage for success. Analysis from various sections of Math 190: Section 0914 Over ½ of the students understood the concept, making no errors or only minor algebraic errors. Only a few (2) students had "most understanding", in these cases they appeared to understand the concept, but their algebra skills were not very good. Those that got "some understanding" had weak algebra skills as well as not having a good understanding of what they were doing. They didn't understand the difference quotient or they failed to realize that they were taking a limit. Overall, those students appeared to have missed the concept of the derivative being a limiting slope. Section 0912 A discussion and group activity at the blackboard proved to be helpful in bolstering student understanding of this SLO and topic. Section 0910 We went over the definition on two separate days and students were provided with a practice worksheet that gave them the opportunity to find the derivate at a value for	**Action:** 1/22/2015 – Overall the students did pretty well in utilizing the definition of the derivative. Next evaluation we would like to change the type of function being evaluated. Instead of using a polynomial function – perhaps we will increase the rigor and utilize a basic rational function or radical function (thus changing the algebra techniques required to evaluate the limit of the difference quotient. (05/12/2015) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** Increasing the difficulty to using a rational function in conjunction with the limit definition of the derivative shows that students need further refining of basic algebra skills such as factoring and combining rational expressions using common denominators. An instructor reports a 54% success rate with such a test problem. (11/01/2017)

Course SLOs	Assessment Method Description	Results	Actions
	correct limit definition is applied to the function and the steps shown indicate the student comprehends the majority of the steps necessary to simplify the difference quotient in an attempt to evaluate the limit. Perhaps one or more algebra errors cause the result to come out incorrect.) 3- Complete understanding – The student obtains the correct value of the limit of the difference quotient by utilizing the proper algebraic process. **Additional Information:**	several different types of functions, including quadratic functions. Since this was the last topic covered before the test, students did not have time to forget the method. I will continue doing the same thing. Section 0920 The success rate for this SLO is 76%. Most of the students met my expectation because I really emphasized how difference quotients are used for various situations. I lectured and encouraged student interaction, and since this strategy was successful, I plan to continue using it. If we have more time, I will give them more examples to practice in class. Section 0906 The success rate for this SLO is 89%. Most of the students met my expectation because I really emphasized how difference quotients are used for various situations. I lectured and encouraged student interaction, and since this strategy was successful, I plan to continue using it. If we have more time, I will give them more examples to practice in class. Section 0904 Students did quite well as many examples were shown in class. Although, more emphasis on homework is needed. Section 0902 Students met my expectations on this SLO. The question was a fairly fundamental one for Calculus I, so we have been doing plenty of examples in class and there are many questions on the homework that are similar to it. So it was particularly helpful to give them lots of practice on the question by giving them the problem in many different forms. Next time, I might try giving students worksheets in class on the fundamental topics, so that they have more practice in class, when I can give them advice on the problems. (01/22/2015) **% of Success for this SLO:**	

Course SLOs	Assessment Method Description	Results	Actions
		Faculty Assessment Leader: Michael Bateman **Faculty Contributing to Assessment:** M. Bateman, J. Ng, J. Evensizer, L. Ho, A. Minasian, Stein, Joe M., A. Hockman, A. Sheynstein, R. Taylor	
SLO #2 SOLVING PROBLEMS - Solve problems, including problems involving velocity and acceleration, by using derivatives and integrals. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Sample test problem: A ball is thrown straight up 6 feet from the ground (it is released 6 feet above the ground). When it is released it is traveling at the rate of 100 feet per second. a) Find the velocity function. b) Find the position function. c) How high does the ball go? d) How long does it take for the ball to reach the ground? In this problem the acceleration is that due to gravity. We will use the value 32 feet per second2. We have to worry about the sign of the acceleration. We will take our coordinate system with distance being positive upward. Gravity acts downward. So our acceleration is -32. Our acceleration function is then the constant function a(t) = -32. **Standard and Target for Success:** We set a target of 65% passing the SLO assessment (that is, scoring a 2 or 3 on the rubric scale). We use the following rubric scale: Score of 3 - All 4 parts are solved to completion using proper methods. Student demonstrates complete understanding of the concepts and	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met We assessed 10 sections of Math 190 for this fall 2015 SLO. A total of 232 students were assessed. We have the following results: Scoring a 3 - 100 out of 232 students (43%) Scoring a 2 - 57 out of 232 students (25%) Scoring a 1 - 42 out of 232 students (18%) Scoring a 0 - 33 out of 232 students (14%) We met our target for success. We have 68% of students passing the SLO assessment (scoring a 2 or 3). Overall we are pleased with the results. We hope to push the rate of success to 70% as an action for a future assessment. ---------- Analysis of Results: Looking over the SLO data and instructor comments, we notice some ways in which we were successful and ways in which we can improve the results. Students seem to be proficient in the techniques of taking basic derivatives of functions. The area that students have trouble is the interpretation of the problem and converting the application problem into mathematics. To improve these results, some instructors have suggested utilizing more technology in the classroom (mathematica / visualization software) and/or having students work on their own or in small groups on problems in class. The action of explaining the problems to one another will help bolster their own	**Action:** We hope to raise the success rate to 70% in a future assessment. Perhaps we will use a different application problem such as related rates to assess calculus problem solving techniques and strategy. (01/20/2017) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** Instructors report varying success rates regarding calculus problems assessed utilizing derivatives with velocity and acceleration (ranging from 55% to nearly 75%). Application problems, in particular involving related rates, continue to be challenging for students. An instructor reports that constructing supplemental handouts consisting solely of related rate problems (in particular focusing on objects in motion) help to alleviate the difficulty with this concept. We continue to emphasize the need for precise notation (especially with related rates), correct units on solutions and looking for context clues in the application problems. (11/06/2017)

Course SLOs	Assessment Method Description	Results	Actions
	material. Score of 2 - Student correctly solves 3 parts to completion. Overall, besides minor errors, the student demonstrates competency in using calculus and derivatives applied to projectile motion. Score of 1 - Student solves 1-2 parts to completion. Otherwise, student shows significant gaps in understanding and applying derivatives and calculus to projectile motion problems. Score of 0 - Student is unable to solve any portion of the problem correctly. **Additional Information:**	understanding. ---------- Summary of Instructor comments: Three out of five of my students showed complete understanding of the material but nearly a fourth essentially failed the question. I expected a slightly better rate of success given that we did problems involving velocity and acceleration in general and projectile motion with acceleration -32 f/s-squared in particular from day one. The teaching method I used was to explore the examples in the early chapters on average rate of change in detail, many of which involved velocity and acceleration. I had students hand in class work on analogous problems and assigned homework involving those problems in each module as the term progressed. Finally, when we got to definite integration, velocity and acceleration were one of the first examples and a subject we inspected deliberately and in detail. Also, the students were quizzed on velocity and position. As for the future, I may try to use some animation or programming to simulate the problem. The students did satisfactory on this SLO assessment with 67% success rate. I demonstrated a problem similar to this in class and assigned many practice problems before putting it on the exam. I'd like to be able to have them practice a problem in class if time permits to help the students gain a better understanding the next time we conduct this assessment. This SLO question was given as a quiz. 76% (19 students) were able to do the problem. 16% (4 students) made some algebraic mistakes and 8% (2 students) were not able to do the problem. Overall, The results in the quiz show that most of the class were able to use derivatives and integrals to solve velocity and acceleration problems.	

Course SLOs	Assessment Method Description	Results	Actions
		ANALYSIS: They got it or they didn't. This problem was on the final so they had not seen the material in a while. The material was presented by substitutes when I was absent due to surgery, so I can't say how the presentation of the material affected the students' understanding. I did give them an acceleration/velocity/position problem on their integration exam, so even though they had not seen this type of problem in a while, we had discussed the topic in general and the relationships between the quantities. Those students listed as "most understanding" pretty much knew what to do but they either just didn't finish the problem (found the times, but then didn't find v(t)) or made bonehead algebra errors (couldn't solve a quadratic equation). Those listed as "some understanding" appeared to understand the relationship between position and velocity, but not much else. The students in the lowest level of understanding did not, for the most part, even apply calculus to the problem. I'm not certain why they didn't try any calculus techniques on a final exam in a calculus course. Their reasoning skills are severely lacking. I'm not certain how some of them made it through intermediate algebra and precalculus. They appear to have no concept of how to approach word problems. Next time I teach this course, I may start off with a day or two covering word problems, maybe some of the ones from my Math 12 class, so that the math won't trip them up, but they can learn the proper way to approach and analyze a problem. To prepare more students for this final exam question, next time I would put it on a midterm exam after covering section 4.9. NOTE: I used the same problem given above, except I changed a few numerical constants so the evaluations could be done without a calculator.	

Course SLOs	Assessment Method Description	Results	Actions
		1. Did the students meet your expectation on this SLO? YES. 2. What teaching method did you use that was particularly helpful? I worked similar examples in class, and I assigned similar problems for homework. 3. What teaching strategy will you try next time to improve the results? I think the results were good, and I will continue using the same strategy. More than half of my students did satisfactory work on this assignment. I did give a similar problem to this and will continue to give additional handouts for added practice. (01/20/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** M Bateman **Faculty Contributing to Assessment:** Bateman, Ho, Numrich, Morales, Sheynshteyn, Hyman, Fogel, Lewis, Hamza, Evensizer	
SLO #3 GRAPHS - Students will use techniques of calculus to determine maxima, minima, and points of inflection on the graph of a function. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2016-17 (Fall 2016) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Consider the function f(x) = e^(-x^2) (or a similar function) (a) Determine any local maxima and minima of f. Express solutions as ordered pairs. (b) Determine any inflection points of f . Express solutions as ordered pairs. **Standard and Target for Success:** We set a target of 70% passing the SLO. Passing is considered scoring 2 or 3 points on the assessment rubric.	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met 260 Students participated in this SLO assessment. Results: Score 0 – No understanding (23 students) : 9% Score 1 – Some understanding (50 students): 19% Score 2 – Most understanding (68 students): 26% Score 3 – Complete understanding (119 students): 46% 72% of students scored 2 or 3 on the assessment and therefore, we met the standard of success for the SLO. Assessment analysis: Q1: Did your students meet your expectations on this SLO? Why or why not?	**Action:** Include more examples in class and in homework. Class examples, which may be done as lecture, group work and students work on the board should include more varied functions: polynomial, rational, exponential, etc. so that students can apply the techniques for a variety of functions and better comprehend the generalities of the techniques. Students might also be presented with more algebra review to better ensure preparedness for the rigors of calculus. (02/27/2018)

Course SLOs	Assessment Method Description	Results	Actions
	We used the following rubric: 0 – No understanding No part of the analysis is done correctly. 1 – Some understanding Correctly calculate the first derivative and locate maximum point. 2 – Most understanding Correctly calculate both derivatives but not all points are correct. 3 – Complete understanding Correctly locate the maximum and both inflection points. **Additional Information:**	(Bateman) The expectations were not what I expected. I provided many examples and handouts with this particular topic. I find that many of the students come into the course with a very weak background in algebra and poor work ethic. (Bateman) My expectations on this SLO was met. Many examples and handouts were provided. (Mata) The students did very well on the SLO and met expectation. Only two students scored below 1 and none scored a 0. Most students showed the appropriate skills to solve the problem and those that scored less than 3 typically made only a minor mistake. With that in mind, the students appear to understand how to solve such problems. The mistakes that students made were either forgetting to list the y-coordinate of the maximum or inflection points, incorrectly calculating the second derivative, or using the e^(-x^2) factor to get a critical number. However, only a few students made such mistakes. (Morales) No. Too many students didn't answer the question correctly. Since the question results were taken from the final exam, the students were probably overwhelmed at the time the question was asked. (Ho) 79% passed this SLO which is better than I expected, considering that they didn't do as well on the other problems.. (Lewis) Two thirds of the class scored well. This is about what I expected. Students should work harder. (Fanelli) 63% of students passed this SLO. More students than expected struggled with the second derivative and hence did not meet my expectations for this SLO. (Hyman) Yes, they did well on this question, as the numbers indicated.	**Action Category:** Teaching Strategies

Course SLOs	Assessment Method Description	Results	Actions

(Wu) The students did not perform well enough to meet my expectation. Some of them panicked on the sight of exponential functions and others forgot some basics about exponentials.

Overall: 6 out of 10 sections had expectations met. Instructors indicate possible difficulties could include student preparedness or study time, and being overwhelmed by the time of assessment.

Q2: What teaching methods / strategies did you find particularly effective with regards to this assessment?

(Bateman) I gave many in class examples and handouts. There are some online interactive programs that are helpful.

(Mata) These types of problems usually require a lot of practice on the students' end. In class, I try to show the students problems with extrema and inflection points for polynomials, rational, exponential, logarithmic, trigonometric, and combinations of these as well. I also assign such problems to students so that they get practice with the variety that occurs in these problems. I also stress that the exponential functions of the form a^x are never equal to zero, so most did not try to get a critical number from that factor of the first or second derivative.

(Morales) Students worked on the board and collaborated with each other and it also gave them an opportunity to ask me questions to receive immediate feedback.

(Ho) I gave lots of practice problems before the test.

(Lewis) I spent more time on examples and proofs.

(Fanelli) Including similar examples in class discussion and

Course SLOs	Assessment Method Description	Results	Actions
		in homework sets. (Hyman) Work lots of examples. Assign lots of homework. (Wu) I did a lot of examples of graphing in class and review sessions, along with group work and homework. The students can graph majority of rational polynomials but seems like they have some struggles with generalizing the method. Overall: Strategies which worked include multiple examples in class and on homework, students working together in class and on the board. Q3: How might you consider improving the student learning of this assessed topic in the future? (Bateman) The students need to spend more time on their homework. I can do hundreds of examples but if the students are doing little to no homework then their labor will bear no fruit. I would consider in the future spending more time reviewing algebra in the beginning of the semester. (Bateman) I would consider in the future spending more time reviewing algebra in the beginning of the semester. With this particular topic algebra seems to be more of a problem than the Calculus. (Mata) In the future, I would try to give more examples with a variety of functions to make sure students get experience with all types of problems, and not just simpler ones such as polynomials or rational functions. I already do this, but I can always strive for more to better help the students. I also think that including a graphing component on such problem helps as well. Then the students can graph the information to form the curve and can notice if certain aspects do not match up. This might allow them to find	

Course SLOs	Assessment Method Description	Results	Actions
		mistakes that they may have missed earlier. (Morales) This question was asked prior in the semester and the students responses were much better, but the results were not recorded. Students did much better when this question was “fresh” in their mind. One SLO question does a poor job in measuring student learning of any topic. (Ho) More in class practice time (if possible) on harder graphic problems. (Lewis) More examples and homework. (Fanelli) Include more similar examples in class and homework as review prior to the exam. (Hyman) After teaching this topic at El Camino for forty years, I would not change anything. (Wu) The one change I will make is to give more variety of function for practice. I did most examples with rational functions, so when seeing exponentials they can't perform as they could normally. Overall: Instructors note that additional student practice of all forms is the best way to improve performance in the future. Some suggestions include additional algebra review, more assigned homework problems and more classwork dealing with more complicated and varied examples. (02/27/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Dominic Fanelli **Faculty Contributing to Assessment:** M Bateman, M Mata, E Morales, L Ho, B Lewis, D Fanelli, J Hyman, B Wu	
SLO #4 PROOFS - Students will analyze and construct proofs involving limits, derivatives, and integrals. **Course SLO Status:** Active			

Course SLOs	Assessment Method Description	Results	Actions

Course SLO Assessment Cycle: 2017-18 (Fall 2017)
Input Date: 11/21/2013
Inactive Date:
Comments::

ECC: MATH 191:Single Variable Calculus and Analytical Geometry II

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate advanced integration techniques and convergence of sequences and series. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Test Question: (a) Determine if the sequence converges - if yes, then determine where it converges: a_n = (3^n+1)/4^n (b) Determine if the given series converges - if yes, then determine the sum of the series: Sum (n=0 to infinity) (3^n+1) / 4^n Alternate Test questions: Find the interval of convergence for the given series: Sum (n=1 to infinity) (1/3x + 2)^n / 7n^2 Alternate series problems for determining the interval of convergence: Sum(n=1 to infinity) (2n)^n / n^(2n) Sum (n=1 to infinity) (n!)^n / (2n)! **Standard and Target for Success:** This SLO was not previously tested under the old SLO structure. So our goal this semester is that 70% of these students will score a '2' or a '3' on this SLO using the following rubric: Category: 0- No understanding (problem is left blank or work shows has no indication of conceptual understanding of the tests for convergence of series). 1- Some understanding (Little	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Met There were 7 sections assessing this SLO during Fall 2014. A total of 160 students participated in this SLO assessment. The distribution of scores is as follows: 13.125% earning score of 0 (21 students), 14.375% earning score of 1 (23 students), 32.5% of students earning a score of 2 (52 students) and 40% of students earning a score of 3 (64) students. The overall success rate is 72.5% (students earning a score of 2 or 3). We successfully achieve our target percentage for success. Sec 9030 This is an improvement over previous semesters. I have spent more time on this concept in lecture. Students need to spend more time studying. Section 0932 The Students did well on this question. The students were exposed to a wide variety of examples. In order to improve they need to do more of the homework problems. I will assign and create more problems for them to practice. Section 0934 The students who consistently do their homework, come to office hours, and go to MESA also consistently do well on the class assessments. Although I was pleased with the results, I know the 6 students who did not do well are capable of learning the material Section 0940 My students' success rate on this SLO is 69% since 20 out of 29 students passed this SLO. This is a bit below my	**Action:** Overall the students who participated in this SLO assessment did well in utilizing the tests for convergence of a sequences and series. Five out of the seven sections used a geometric sequence and series to be tested for convergence. For the next evaluation, instead of using a geometric series, we would like to use a series that requires students to use a test for convergence other than the geometric series test. We may use a series that can be tested for convergence using the ratio or the integral tests. (01/30/2015) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** With regards to our initial assessment of the geometric series convergence / divergence behavior, continuing to assess different convergence / divergence tests (success rate around 60%) reveals a need to continue developing ways to increase student confidence and understanding in this topic. Since the idea involves a lot of abstraction, continuing to develop handouts and emphasizing students express the steps in complete statements with the proper terminology becomes very important. (11/06/2017)

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	conceptual understanding of the tests for convergence of series) 2- Most understanding (Students were able to apply the tests for convergence of series and the steps shown indicate that the student comprehends the majority of the steps necessary to test the given series for convergence. Perhaps one or more algebra errors cause the result to come out incorrect.) 3- Complete understanding (The student was able to apply the correct test for convergence of series with no algebraic mistakes). **Additional Information:**	expectation since I was expecting 70% of the students would pass this SLO. I noticed that more students got part (b) series correct than part (a) sequence correct. This is because they applied the Nth Term Test on sequence instead of series. In the future, I will take some time to review sequence before the exam, so they don't confused sequence with series. Section 0936 22 students out of 25 were able to apply the tests for convergence of sequence and series to the given sequence and the given series. The 10 students who received a score of 2 were able to apply the test for convergence correctly but they made some unexpected algebraic mistakes. The 3 Students whose scores were 0 or 1 did not complete their homework and missed several class lectures. I will keep encouraging students to do their homework assignment daily, participate in class discussions, seek help when something is unclear or difficult and never miss a class lecture. Overall the class met the target percentage for success. Section 9042 I'm not sure what to say. Given that most of the students did exceptionally well on this problem, the 6 students who did not, probably did not complete their homework or seek help when they did not understand the material. No one asked the kinds of questions in class that would indicate total confusion. I'm not sure what I could have done to assist these students, other than encourage them to ask for help and to work very hard on their homework until they are sure they understand the concepts. I'm pretty sure that the students who did not understand this particular problem also had trouble with other problems on this exam as well as the other exams. This was not an isolated incident for them. Section 0944 The students did not meet my expectation on this SLO assessment. For something as basic as this, I would have	

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		expected that at least more than half the class would have complete understanding, and that definitely less than 5% or 10% would have no understanding. Why someone would not see that the series was the sum of two geometric series, each of which has a common ratio whose absolute value is less than 1, and hence convergent, is very surprising to me. The next time I teach this class, I will be giving more quizzes, and also collecting and grading select homework problems. I hope that this type of result never happens again. (01/30/2015) **% of Success for this SLO:** **Faculty Assessment Leader:** H. Hamza **Faculty Contributing to Assessment:** R. Lewis, J. Cohen, G. Fry, H. Hamza, L. Ho, J. Evensizer, R. Taylor	
SLO #2 SOLVING PROBLEMS - Students will use integrals to evaluate volumes, surface area and arc length. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Find the volume of the solid of revolution generated by revolving the region between y=e^x, y=0, x=0, and x=2, around the axis x = -1. **Standard and Target for Success:** Rubric: 0 – No understanding The student is unable to draw a graph illustrating the solid or set up an appropriate integral. 1 - Some understanding The student is able to illustrate the situation and/or identify an appropriate method, but is unable to write down an appropriate integral. 2 –Most understanding The student is able to set up an integral that has only minor problems, or makes a computation	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met We assessed 7 sections of Math 191 for a total of 207 students. We had 18 students score a 0. This was 8.7% of the student population. We had 56 students score a 1. This was 27.0% of the student population. We had 61 students score a 2. This was 29.5% of the student population. We had 72 students score a 3. This was 34.8% of the student population. Overall the success rate was 64.3%. This means we met our target success rate of 60%. ----------	**Action:** We would like to improve the success rate to around 65%. Further, we should expand the question to include concepts such as surface area and arclength. (01/29/2017) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** The volume and surface area of revolution problems still present a challenge for students. One instructor reported a 55% success rate with assessing a problem regarding using the disk and shell methods for finding the generated volume of a solid of revolution. Creating handouts with more problems and having students actively work together / on the board with these types of challenging and involved problems helps them develop their problem solving

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	error in evaluating the integral. 3- Complete understanding The student is able to set up and correctly evaluate an appropriate integral for the volume. Target for Success: We set a target for 60% of our students to achieve a 2 or 3. **Additional Information:**	Analysis of Results: Central to problem solving for Calculus II is training students to visualize and sketch functions in addition to solids in 3-dimensions. Reinforcing basic concepts from pre-calculus (such as trigonometric functions) can help alleviate some performance issues. Trigonometry is also central to many of the difficult ideas in Calculus II. Without the foundation, we run into trouble. Many instructors have commented that students have trouble setting up the problem while the integration goes pretty smoothly. Using some mathematical visualization software in classes can help bolster student ability to sketch appropriate diagrams and see the solids of revolution actually being generated. Putting students into groups can also help them develop their problem solving skills by collaborating and bouncing ideas off each other. ---------- - Summary of Instructor Comments: 0944 - Overall the result is good since 77% of the students scored a 2 or 3. What worked: I went over this concept for 3 hours in class, which correspond to sections 6.2 and 6.3, a study guide was given to practice for the test, and I did two problems similar to the SLO question during the review session the day before the test. Even though 77% is a good passing rate but to increase that , next time I will warn the students on reading and working the problems on study guide carefully and assigned extra problems on the study guide for them to practice at home. 0946 - My students did not meet my expectation. Many of students in category 1 tried to use “washer method” instead of “shell method”, and they got trapped! I realize that I need to teach my future Math 191 students how to determine when one method is better than the other method through comparison using several examples.	skills. (11/06/2017)

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		0948 - 1. Did the students meet your expectation on this SLO? Several of my students scored a 1 on this. They did not meet my expectation. Of these students and the 2 who showed no understanding, repeating the course will be necessary and I am unconcerned. However, there are a few who passed the course even with a B. Their grades on this particular skill were poor. They do not seem to have much strength in questions like this that require some conceptual and graphical understanding though they certainly did quite well on skills that required a high level of analytical thinking and processing. 2. What teaching method did you use that was particularly helpful? The students that were successful were able to follow my lead in which I advised them to graph the functions and to draw the cross sections. I made sure they practiced drawing these cross sections. 3. What teaching strategy will you try next time to improve the results? Next time I teach this I plan on giving them a tech assignment in which they will get the computer to generate some visuals. I think this will help the students with weaker conceptual abilities. 0950 - For the volume set up, I think I need to emphasize the concepts better. More manipulatives, more pictures. For integration by parts, the students seem to do very well. I tend to emphasize it and use it often. 0952 - With 63% of the assessed students (20 out of 32) scoring at most or complete understanding, I feel expectations were met for this notoriously difficult topic. Students found the use of multiple examples demonstrated in lecture effective at improving understanding. In the future perhaps using visualization software such as Mathematica to display / construct solids of revolution might help with student understanding of these volume problems.	

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		0954 - Overall, I was very happy with the results especially since they came from the final exam not a midterm quiz. I think I was successful this term since we spent extra time on this topic and focused more on the conceptual elements (sketching the curves, moving the axes, doing problems using both the methods of washer and cylinders) rather than computational questions. 0956 - (1) I purposely put this question on the final exam to verify that they had not forgotten what they were supposed to have learned during the first part of the semester. This question could have been placed on exam one, and the results probably would have been better, but retention was what I was interested in. The fact that about 38% of the students demonstrated complete understanding seemed reasonable to me. However, that about 47.6% demonstrated either no understanding or some/minimal understanding is intolerable. (2) Sketches are what I emphasize as a critical tool to model problems. It is not enough to try to just memorize formulas and hope that you are applying them properly. In this instance, the 2*PI*r*h*delta_r “formula” for cylindrical shells needs to be applied to the context of the problem at hand. With a proper sketch, and proper understanding, it is obvious that r in this case is x-(-1)=x+1 and that h is e^x and delta_r is delta_x. Using this information to set up the integral, the x*e^x component results in an integration by parts application. This is another thing that I emphasize to my students: REVIEW. Basic integration techniques should not be forgotten. (3) I will definitely be having more quizzes, split evenly between those where they know what the topic is and those where the topic will be a “surprise”, i.e. anything we have previously covered. The class I taught this semester was an evening class, and many of the students who take evening classes do so because they are working full-time. It is also more likely that they have children (one of the students has a daughter that is 3 months old, and many times came to class obviously in need of sleep). Hence, without good time management skills it is very easy for	

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		them to get behind in their studies. Early intervention for this group becomes especially important, and I intend focus more on this in the future. (01/25/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** Ben Mitchell **Faculty Contributing to Assessment:** S. Taylor, A. Seyedin, R. Taylor, P. Yun, T. Meyer, Z. Marks, B. Mitchell	
SLO #3 GRAPHS - Students will use limits, derivatives and integration to analyze graphs of parametric equations, polar equations, and conic sections. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2016-17 (Fall 2016) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** SLO QUESTIONS: Find the area involving a polar curve or polar curves. I. Paul Yun(PY): (a) inside r = 5sin(3theta), (b) inside r = 2 –cos(theta) and outside r = 1. II. Benjamin Mitchell(BM): Inside r = sin(theta) and r = 1 – sin(theta) III. Robert Lewis(RL): Between r=1+ Cos(x) and r=Cos(x) IV. Christine Charles-Bohannon(CC): Inside r = 3sin(theta) and r = 1+sin(theta) V. Hamza Hamza(HH): Inside r = 3sin(theta) and outside r = 2 –sin(theta) VI. Jeffrey Cohen(JC): For r=3sin(theta) and r = 1+sin(theta), shade the area and set up(do not evaluate) an integral that represents the shaded area (a) both inside the circle and outside the cardioid, (b) both inside the cardioid and outside the circle RUBRIC: 0 - No understanding: A student does not know how to express the area using a definite integral of a polar equation or polar equations.	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met ASSESSMENT DATA: 201 students participated in this SLO assessment using Test Problems below. Here are the results Scoring Rubric: 0 - No understanding (19 students): 9.4% Scoring Rubric: 1- Some understanding (49 students): 24.4% Scoring Rubric: 2- Most understanding (76 students): 37.8% Scoring Rubric: 3- Complete understanding (57 students): 28.4% 66.2% of students scored a '2' or '3' on the assessment and therefore, we met the standard and target of success. ANALYSIS: We analyzed the data by answering the following three questions. Question 1: Did your students meet your expectations on this SLO? Why or why not? PY: The majority of students understand that they need to use integration to find area of the region bounded by polar curve(s). The majority knows how to sketch the curves and how to set up integration for area even though students who did not get the perfect score made mistakes by making incorrect limits of integrations or computing incorrectly. In this aspect, my students meet my expectations on this SLO.	**Action:** Continue to help students master how to graph polar curves and how to set up the area bounded by a polar curve or polar curves using a definite integral through more problem solving and more activities, and how to solve the resulting integral question correctly by sharpening their integral skills through a lot of practice! (02/18/2018) **Action Category:** Teaching Strategies

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	has some idea to express the area using a definite integral of a polar equation or polar equations but the integral expression and/or computation are incorrect. 2- Most understanding: A student knows how to express the area using a definite integral of a polar equation or polar curves correctly with a minor computation error or slightly incorrectly with or without a minor computation error. 3- Complete understanding: A student expresses and compute the area using a definite integral of a polar equation or polar curves correctly. **Standard and Target for Success:** We set a standard of at least 65% of students assessed score a '2' or '3' on the assessment. **Additional Information:**	BM: Yes, overall my students met my expectations. 75% of the students were able to successfully understand the problem and set it up correctly. To me, even though some of these students made computational errors following the correct set up, they understood the major concepts of area in polar coordinates, symmetry, and intersections. Overall, this is more important to me than computing the exact value. RL: Student results are generally good. I spent more time this semester on the fundamentals of polar coordinates. CC: Yes and no. Since we covered the topic so late in class, I figured they would not be completely prepped for it. However, an example of a very similar problem was given in class within the week before the final. The students seemed to do well during the short activity but did not do quite so well on the test. I suspect that stems from being allowed a book during the class activity. HH: Yes, the students met the expectations, since 76% of the students who participated in this assessment were able to identify the region and set up the correct integral. JC: My students met my expectations in that 23 out of 34, 68% (section: 0946) and 23 out of 31, 74% (section: 0952), showed most or complete understanding. OVERALL ANALYSIS: The majority of instructors conclude that their students meet their expectations on this SLO. Instructors point out that the majority students know how to set up the integral correctly with some computation mistakes. Question 2: What teaching methods / strategies did you find particularly effective with regards to this assessment? PY: I realize that the majority of Math 191 students are not confident in graphing polar curves. I spent a lot of time for re-teaching how to sketch polar curves. I notice that the	

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		majority of my students drew curves correctly so that they set up an integral for area correctly by finding correct lower and upper limits of integration and use symmetry. BM: I think I was successful for two reasons. First, I stress even starting from parametric areas the concept of picking the smallest symmetric piece to make computations easier. I saw in my student's work that this certainly helped with understanding this more complex area. Further, also when teaching polar areas stressed the idea that you are determining an area that is "swept" out rather than underneath. In the past, I simply commented on this but this time I focused more on explaining why this changes our perspective when setting up integrals. This attention to a small detail seemed to benefit the students, especially in understanding why the integral needed to be split. RL: I spent more time this semester on the fundamentals of polar coordinates. CC: I wound up introducing the polar area section using comparisons to rectangular area under the curve (just one curve to start). Then, for the area between curves, I gave an example they were to complete on their own. I walked around and monitored how the students were doing. A more student-participatory approach seems to be quite effective. HH: Students are encouraged to participate in class discussions and they are often asked to work on problems during class. These practices enable me to identify their learning weaknesses. JC: I found that using the graphing calculator, in Polar Mode, was very effective. Using the "bubble" feature of the graph as well as tracking various intervals on theta helped students understand how area was being swept out. OVERALL ANALYSIS: The majority of instructors mention that they focused on helping their students understand how	

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		to graph polar curves and their properties. They conclude that the strong foundation in polar curve graphing skill led to the correct setup of the definite integral of the polar area. They also point out that focusing on details helps students. Question 3: How might you consider improving the student learning of this assessed topic in the future? PY: I would like to evaluate each student's ability to sketch polar graphs and to set up an integration for area and give them feedback. Then I expect that my students will better perform on solving calculus questions involving polar graphs. BM: In the future, I would like to supplement my lecture on polar areas with some additional worked out examples that I will post on the students' team site. I think this will give some of the students who need a bit of extra practice a chance to catch up to the other students. I've also found this technique of supplemental examples outside of class beneficial in other classes so I'm sure it will be helpful in Math 191 as well. RL: I could spend more time at the expense of chapter 11, but I view this as a poor choice. CC: I would give more time to go over problems like these in detail. I did not put the SLO question on an exam until the final exam and we covered polar area a week or so ago. HH: Collaborative learning is a practice that I use in teaching Mathematics. Students' participation in class will be maintained and improved through handouts, activities, and in classwork. I may also assign grades for participation. JC: I will continue to use the graphing calculator and possibly add more activities. OVERALL ANALYSIS: The majority of instructors mention	

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		that more problem solving and more activities of graphing polar curves and setting up definite integrals will help students learn how to find the area bounded by a polar curve or polar curves. (02/18/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Paul Yun **Faculty Contributing to Assessment:** Paul Yun, Benjamin Mitchell, Robert Lewis ,Christine Charles-Bohannon, Hamza Hamza, Jeffrey Cohen	
SLO #4 PROOFS - Students will analyze and construct proofs to determine convergence and divergence of sequences and series. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2017-18 (Fall 2017) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**			

ECC: MATH 210:Introduction to Discrete Structures

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate an understanding of the key principles of logic, number theory, combinatorics, probability and graph theory. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Suggested Test Question: Let set A be the set of all English logical statements. For all p and q in A, pRq ? (p?q is true). Determine if the relation is each of these and explain why or why not. (a) Reflexive (b) Symmetric (c) Transitive (d) Antisymmetric **Standard and Target for Success:** This is the first time we assessed this SLO under the new SLO structure. So our target goal this semester is that 70% of the students will score a "2" or a "3" on this SLO using the following rubric: 0 –No understanding (answered 1 out of 4 parts or none correctly). 1 –Some understanding (answered 2 out of 4 parts correctly). 2 –Most understanding (answered 3 out of 4 parts correctly). 3- Complete understanding (answered 4 out of 4 parts correctly). **Additional Information:**	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Met Category Number of students 0 –No understanding 0 1 –Some understanding 4 or 15% 2 –Most understanding 8 or 30% 3- Complete understanding 15 or 56% Total number of students 27 Overall 86% of the students passed the SLO and we met our target goal. The students did well on this question. They were exposed to several examples related to the classification of relations. In order to improve I will provide more examples, I will assign and create more homework problems for the students to work on. (01/15/2015) **% of Success for this SLO:** **Faculty Assessment Leader:** Greg Fry **Faculty Contributing to Assessment:** Greg Fry	**Action:** Overall, the students did very well on logic and relations. Next time, we want to assess a different topic such as number theory, combinatorics, probability or graph theory to check for full understanding of this SLO. (11/30/2018) **Action Category:** SLO/PLO Assessment Process
SLO #2 SOLVING PROBLEMS - Students will use logic, functions, number theory, and combinatorics to solve a variety of problems, including application problems and computer science algorithm analysis.	**Exam/Test/Quiz -** (a) Find the gcd(20,637) as a linear combination of 20 and 637. (b) Find the smallest positive inverse of 20 (mod 637) (c) Find the one solution x,	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met 1 section of math 210 (23 students) were assessed (the only section offered during fall 2015).	**Action:** We saw a high success rate (91%) for the fall '15 SLO assessment. For future assessment of SLO #2, we would like to possibly increase the rigor of the problem and/or change the nature

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Course SLO Status: Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	with 0 < x < 637, to the linear congruence 20x = 101(mod 637) **Standard and Target for Success:** We set a target success rate of 70% for this SLO (scoring 2 or 3 on the rubric scale). We use the following rubric scale for this SLO test problem: Score of 3 – Student solves all 3 parts of the problem correctly with the correct procedures demonstrated. The student clearly understands the concepts completely. Score of 2 – Student solves 2 of the 3 parts correctly. Computational error(s) might be present but overall the student has strong grasp of the material. Score of 1 – Student solves 1 of the 3 parts correctly. Significant gaps in student understanding of gcd, modular arithmetic number theory ideas are clearly present. Score of 0 – None of the 3 parts are solved correctly. **Additional Information:**	Scoring a 3 – 16 out of 23 students (or 70%) Scoring a 2 – 5 out of 23 students (or 21.7%) Scoring a 1 – 2 out of 23 students (or 8.7%) Scoring a 0 – 0 out of 23 students (0%) Overall we see 21 out of 23 students scoring a 2 or 3 – thus a 91% success rate. The target for success is met for this SLO. Analysis of results: The students did very well. Almost everyone showed complete or almost complete understanding. Showing a variety of examples was useful. Assigning an array of problems was useful, too. In the future I will create more examples and more practice problems so that the students can be even more prepared. (01/17/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** G Fry **Faculty Contributing to Assessment:** G Fry	of the problem to assess a different skill set for discrete mathematics. (01/17/2017) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** Assessing a more difficult combinatorics problem (involving probabilities) resulted in a lower success rate (approx. 70%). This is to be expected as the rigor of the problem was much higher than was previously assessed. Having students practice the elementary rules of probability (multiplication/conditional,etc…) will help with these types of problems that are central to discrete math. (11/06/2017)
SLO #3 GRAPHS - Students will analyze and solve problems in graph theory. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2016-17 (Fall 2016) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Essay/Written Assignment -** The question is as follows and is scored on a scale of 0 to 3: A high school has six students interested in running for student council and five positions to fill on the council.	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met Out of 37 students assessed, the scores were as follows: Score of 3 - 28 (75.7% of students assessed) Score of 2 - 7 (18.9% of students assessed) Score of 1 - 2 (5.4% of students assessed) Score of 0 - 0 (0% of students assessed)	**Action:** We will provide a wider array of examples to students, including ones that extend beyond those covered in the textbook. More visualization in terms of graphs both in class and on handouts will help the students improve and reduce small errors. (02/23/2018)

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	• John wants to run for president and secretary. • Stacey wants to run for vice president and treasurer. • Gary wants to run for treasurer, secretary, and public relations officer. • Marsha wants to run for president and vice-president. • Ken wants to run for public relations officer and treasurer. • Barbara wants to run for treasurer only. (a) Model the students' desire to run for certain positions using a bipartite graph. (b) Based on the graph from (a), find a student for each position such that each position is assigned only one student. **Standard and Target for Success:** The standard for success is 70% of the students scoring a 2 or 3 on a scale of 0-3: 0 – No understanding: The student leaves the problem blank OR has a solution unrelated to bipartite graphs. 1 – Some understanding: The student incorrectly diagrams the bipartite graph, AND leaves the position assignment blank OR incorrectly assigns a student to each position based on their graph. 2 – Most understanding: The student	Overall, 35/37 or 94.6% of the students scored a 2 or 3, well above the standard of 70%. The students showed a strong understanding of the material and most mistakes were simple errors in problem solving and not due to lack of comprehension. For example, a few students mistakenly associated a student in the problem with the wrong position or made other minor errors in drawing the graph. Based on the graph, almost all students were able to accurately assign each student in the problem to an appropriate position. In the future, a wider array of problems could aid in understanding and additional practice could alleviate some of the minor error seen in some solutions. Instructor Comments: Matthew Mata: Sixteen of the 18 students correctly answered the question, so this does meet expectations. The only minor mistakes were drawing the bipartite graph incorrectly. Even in this case, the second half of the problem was still completed correctly. Showing multiple examples in class seemed to be helpful. Using more variety and different types of problems that lead to bipartite graphs my aid in comprehension in the future. Greg Fry: I am happy with the results. They worked hard, asked good questions, and demonstrated that they understood the concept. The presentation of various examples to illustrate different aspects of the problem was effective. I plan to find more examples to show variations on uses of bipartite and other graphs. I will also create a wider variety of practice problems. If the students have more practice problems, then this will help students who seriously work through them. (02/23/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Matthew Mata **Faculty Contributing to Assessment:** Matthew Mata, Greg Fry	**Action Category:** Teaching Strategies

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	correctly diagrams the bipartite graph AND incorrectly assigns a student to each position, OR incorrectly diagrams the bipartite graph BUT correctly assigns a student to each position based on their graph (if possible). 3 – Complete understanding: The student correctly diagrams the bipartite graph AND correctly assigns a student to each position. **Additional Information:**		
SLO #4 PROOFS - Students will analyze and construct proofs in logic, number theory, combinatorics, probability and graph theory. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2017-18 (Fall 2017) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**			

ECC: MATH 220:Multi-Variable Calculus

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate partial derivatives, multiple integrals and the major theorems of vector calculus. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** I. ACTUAL QUESTIONS: Q1. (Faculty Paul Yun's SLO question) Find the partial derivative at (t, s) = (0, 0) for z =(e^y)(cos3x), x = 4t+s^3, y = t^5+3s+1. Q2. (Faculty Ashod Minasian's SLO question) Find the partial derivative at (t, s) = (0, 0) for z =(e^y)(cos3x), x = 4t+s^3, y = t^5+3s+1. Q3. (Faculty Robert Horvath's SLO question) Consider the function z = f(x, y) = (x^2)(e^y), x = t^2 − 1 , y = sin t. Use the Chain Rule to compute dz/dt as a function of t only (no x's and no y's in your final answer.) II.RUBRIC 0- No understanding (Student does not understand the core concept.) 1-Some understanding (Student has a vague idea on the core concept, and fails to carry out necessary calculation.) 2-Most understanding (Student understands the core concept, and makes a minor computational error.) 3-Complete understanding (Student understands the core concept, and solve the problem without an error.) **Standard and Target for Success:** It is expected that 80% of the students will score a 3 or 2.	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Met I. RESULTS 85 students participated in SLO assessment. 2 students or 2% scored a 0. 7 students or 8% scored a 1. 10 students or 12% scored a 2. 66 students or 78% scored a 3. II. ANALYSIS 1. Due to their strong foundation in differentiation from single variable calculus courses math 190 and math 191, they could easily learn partial derivatives. A brief review of differentiation was helpful to students. 2. The majority of students understand partial derivatives. (11/16/2014) **% of Success for this SLO:** **Faculty Assessment Leader:** Paul Yun **Faculty Contributing to Assessment:** Ashod Minasian & Robert Horvath **Related Documents:** SLO Fall 2014 - Math 220 over all blank.docx ACTION for Math 220 SLO for Fall 2014.docx	**Action:** 1. Since the majority of students understand the concept, we will continue the similar teaching strategy. 2. Flip-n-teach and teach-n-flip. 3. For the nine students who scored a 0(No understanding) and a 1(Some understanding) , we need to encourage to put in their effort and to study hard. We also need to encourage the students who have work related issues to balance time between study and work. For those who have health related issues, we need to encourage them to take care of their health first before they enroll in an intense course like Math 220 multivariable calculus. (12/11/2015) **Action Category:** Teaching Strategies **Follow-Up:** Applying some suggestions from other instructors, putting students in groups and emphasizing students be mindful of their health and time commitments continues to show promise. Our previous assessment of partial derivatives had a high success rate so future assessments of this SLO should involve multivariate integration or another related topic to get a broader idea of student comprehension of multivariable calculus techniques. (11/01/2017)

Course SLOs	Assessment Method Description	Results	Actions
	Additional Information: **Related Documents:** SLO Fall 2014 - Math 220 over all blank.docx SLO Fall 2014 - Math 220 overall.docx		
SLO #2 SOLVING PROBLEMS - Students will calculate partial derivatives for a function of more than one variable and use them to solve multivariable optimization problems; and evaluate double and triple integrals, and apply them to physical problems such as moments and centers of mass. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Students will calculate partial derivatives for a function of more than one variable and use them to solve multivariable optimization problems; and evaluate double and triple integrals, and apply them to physical problems such as moments and centers of mass. Sample Problem: Find the point(s) on the surface (cone) with equation z^2 = x^2 + y^2 that lie closest to the point (4, 2, 0). Hint: We can minimize the distance d easier by considering the square of the distance d^2. Scoring rubric: 0 – Student demonstrates no progress to the solution. 1 – Student determines an appropriate multivariable function for the distance (or distance squared for convenience) from the point to the cone surface. 2 – Student finds appropriate partial derivatives and critical value(s) needed to minimize the distance. 3 – Student solves the problem to completion and provides the correct	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met We assessed 4 sections of Math 220 for this SLO. We summarize the results as follows: A total of 126 students were assessed. Scoring 3: 65 out of 126 students (or 51.6%) Scoring 2: 39 out of 126 students (or 31%) Scoring 1: 14 out of 126 students (or 11.1%) Scoring 0: 8 out of 126 students (or 6.3%) We are very pleased with the results of the SLO assessment. We had an 83% success rate (students scoring a 2 or 3 on the assessment) ---------- Analysis of results: Students seemed to meet or exceed expectations with this SLO. Instructors found that utilizing a variety of teaching strategies from traditional lecturing to putting students into collaborative groups helps to strengthen student understanding of applying multivariable calculus. Assigning a variety of homework problems and having students practice the ideas frequently will help to improve future results. Some things we can try for future assessments of this SLO include using math visualizing software in class to generate images and animations of the calculus at work. Optimizing quantities in three-dimensions definitely takes some getting used to and having strong visual aids will help bolster student understanding.	**Action:** We saw high success rate on the SLO assessment during fall 2015. Thus, for a future assessment of SLO #2, we would like to change the nature of the optimization-type problem to incorporate different skill sets utilized in the multivariable calculus course and/or increase the rigor of the assessed problem. (01/16/2017) **Action Category:** SLO/PLO Assessment Process **Follow-Up:** We continue to assess different applications of partial differentiation including minimizing / maximizing using Lagrange Multipliers and partial derivatives. Our previous assessment involved minimizing distance – a different assessed problem involved minimizing the amount of material necessary to construct a prism under certain constraints. (11/01/2017)

Course SLOs	Assessment Method Description	Results	Actions
	coordinates of the points of interest. **Standard and Target for Success:** We set a target of 70% rate of success (that is, scoring 2 or 3 on the rubric scale). **Additional Information:**	--- Some comments left by instructors were as follows: I was pleased with the results and would say that my students did meet my expectations. I find it to be particularly helpful when the students have time in class to collaborate and communicate with each other about their ideas and strategies. It also gives me an opportunity to circulate and interact with them. Having taught this course about 20 times, I thought that the students actually exceeded expectations. I did what I've done all previous times I taught the course. I stand in front of the class and explain the idea clearly, and go over related homework problems when they ask about them. This seems to work pretty well, so I'm planning on staying the course. The students did very well on this question. I was pleased. The students who didn't do enough practice problems didn't do as well. I will create more examples and practice problems. These will have slight variations so that future students have a greater variety of problems to practice outside of class. (01/16/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** Z Marks **Faculty Contributing to Assessment:** Fry, Cohen, Minasian, Stein	
SLO #3 GRAPHS - Students will analyze the graphs and equations of curves and surfaces in three-dimensional space, as well as vector fields. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2016-17 (Fall 2016)	**Exam/Test/Quiz -** Consider the function: $z=f(x,y)= v(x^2+y^2-4)$ Find the domain Sketch the domain Find the range Describe the surface Draw a contour map showing at least 5 level curves.	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met We collected data from 119 students in Math 220. The results were as follows: Score of 3: 39 students (33% of those assessed) Score of 2: 47 students (40% of those assessed)	**Action:** We will come up with new examples and practice problems to help the students better understand the concepts. One idea is to have the students manipulate the equations of the basic surfaces to see what kinds of forms they can create.

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Input Date: 11/21/2013 **Inactive Date:** **Comments::**	**Standard and Target for Success:** We set a target of 70% success for this Math 270 assessment (that is, at least 70% of students scoring a 2 or 3). Rubric: 3 – all correct 2 – one or two mistakes 1 – three or four mistakes 0 – no understanding **Additional Information:**	Score of 1: 27 students (23% of those assessed) Score of 0: 6 students (4% of those assessed) Our target of success was met with a 73% success rate on this SLO assessment. Overall, we were pleased with the results. We exceeded our target success rate by 3%, Specific Instructor Comments: Jasmine Ng: My students met my expectations. This is a tough problem since domain and range are always tough to find. However, they showed fair competency in each part of the question. We went over the equations and properties of some basic surfaces in three dimensions in class. We also compared and contrasted the different basic surfaces. I think that lecture helped them a lot with this problem. I would try asking students to manipulate the equations of the basic surfaces and seeing what other forms they can get. That way, the students can better recognize what surface they are given no matter how much the equation is manipulated. Oscar Villareal: The students' performance is consistent with the performance in previous classes. With half of the class having a good grasp and 86% having a working knowledge, I felt the performance was adequate. I think a strong use of technology is useful here. This tests the students' ability to reason in three dimensions and the ability see the graph of a function and manipulate it is invaluable in their understanding. This SLO has made clear to me that most of the students don't quite connect the domain of a function and the level curves. The level curves live in the domain and some exercises with technology should be able to make this point clear. Greg Fry: I was happy with the results of my students. Two-thirds of the class achieved the two highest levels and exhibited a very good grasp of this concept. Students who	(02/13/2018) **Action Category:** Teaching Strategies

Course SLOs	Assessment Method Description	Results	Actions
		take the time to do the homework and study do very well in this class. We went over several examples in class and the students had several homework problems. Also, technology helped to illustrate harder examples. I plan to create more examples, create more variations for the homework practice problems, and to make better use of technology to illustrate the concepts related to three-dimensional surfaces. (02/13/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Greg Fry **Faculty Contributing to Assessment:** Jasmine Ng, Ashod Minasian, Oscar Villareal, Greg Fry	
SLO #4 PROOFS - Students will analyze and apply Green's, Stokes, and Gauss' Theorems. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2017-18 (Fall 2017) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**			

ECC: MATH 270:Differential Equations with Linear Algebra

Course SLOs	*Assessment Method Description*	*Results*	*Actions*
SLO #1 UNDERSTANDING CONCEPTS - Students will explain and demonstrate the key concepts of linear algebra, including determinants, vector spaces and linear transformations. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2014-15 (Fall 2014) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Test Question (Used by S. Taylor) : Let V be the vector space of 2 x 2 symmetric matrices with Real entries. a) Show that dimV = 3 b) Find a basis for V. Test Question (used by J. Evensizer): Let W denote the set of all 2 x 2 matrices whose trace is zero. a) Show that W is a subspace of M2(R) b) Find a basis for and the dimension of W. **Standard and Target for Success:** This SLO was not previously tested under the old SLO structure. So our goal this semester is that about 60% of the students attain good to excellent understanding of the problem using the following rubric: Scoring Rubric: 3 - Excellent - Students demonstrate complete understanding of the concepts of basis and dimension and can apply them to examples such as a space of symmetric matrices or matrices with trace zero. 2 - Good - Understanding of the general concepts of basis and dimension is apparent. Perhaps there is some flaw in the reasoning of the proof structure and/or notation. Perhaps not all axioms of subspace were verified in the proof.	**Semester and Year Assessment Conducted:** 2014-15 (Fall 2014) **Standard Met? :** Standard Not Met There were 2 sections of Math 270 participating in this SLO during Fall 2014. The distribution of scores is as follows: 27% (20) students earned a score of 3, 11% (8) students earned a score of 2, 54% (40) students earned a score of 1, and 8% (6) students earned a score of 0. Due to a small sample size for this advanced math course, we get a variety of results depending on the nature of the SLO problems and the materials used to teach the course. One section (0970) had a bit more trouble with the SLO and this could be a due to a variety of reasons. In this case it is imperative we consider the following: Most textbooks spend far too much time dealing only with linear spaces consisting of n-dimensional vectors with Real (or Complex) components and hardly any time at all with linear spaces whose elements are functions or matrices or infinite sequences or whatever. They usually even call them vector spaces, further reinforcing the R^n concept. Thus it is only natural for students to try to make a basis using elements from R^n, even when the elements of the vector space are something else. Section(0970): Many students wrote a set of 2x1 vectors as the bases for 2x2 symmetric matrices - in this case earning little to no credit. Many did identify the dimension as the number of basis elements however we did not feel this was sufficient for a score of 2 on the problem. The concept will be emphasized further in class and may be utilized again on the term final exam. Section 0972: The students did well. I emphasize over and	**Action:** 1/29/2015 - Overall, we got some mixed results with the SLO. We would like to see closer to 60% of the students reach the good to excellent understanding on the SLO when assessed again. The course is quite advanced and requies a substantial amount of abstract thinking for our higher level STEM students. Continuing to have the students work individually and collaboratively on problems related to basis and vector spaces will help improve performance. (01/29/2018) **Action Category:** SLO/PLO Assessment Process

Course SLOs	Assessment Method Description	Results	Actions
	1 - Fair - Some understanding of the concept of basis and dimension is apparent but proving the proper axioms appears to be an issue. 0 - Unsatisfactory - LIttle to no understanding of basis and/or dimension of vector space is demonstrated. **Additional Information:**	over again that the basis must be made of elements of the space itself, so most of the students gave me a basis of 2 x 2 matrices with a trace of zero (or at least a basis of 2 x 2 matrices). Showing that it is a subspace and finding the dimension don't pose as much of a difficulty as finding an appropriate basis. (01/29/2015) **% of Success for this SLO:** **Faculty Assessment Leader:** J. Evensizer **Faculty Contributing to Assessment:** J. Evensizer, S. Taylor	
SLO #2 SOLVING PROBLEMS - Students will use differential equations and linear algebra to solve a variety of problems, including application problems. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2015-16 (Fall 2015) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Rainbow Pond has a constant volume of 1,000,000 gal. There is an industrial plant on the shore of the pond which has been allowing pollutants to flow into the pond for some time. The industrial plant pumps polluted water into the pond at the rate of 2 gal/min and Iridescent Creek flows out of the pond also at a rate of 2 gal/min. The concentration of pollutants in the effluent from the industrial plant is a constant. Water samples show that currently 10% of the pond water consists of pollutants. (Assume that the water and pollutants in the pond are well mixed.) a) Set up a differential equation to model this situation. Be sure to define all of your variables, as well as any other symbols (e.g. for unknown constants) that you use, completely and carefully. b) Solve your differential equation and find an expression for the amount of pollutants (in gallons) in the pond at any time. (Your solution will contain an unknown	**Semester and Year Assessment Conducted:** 2015-16 (Fall 2015) **Standard Met? :** Standard Met Three sections of math 270 were assessed for this SLO. A total of 77 students were assessed. SLO results: Scoring a 3 - 36 out of 77 students (that is, 47%) Scoring a 2 - 26 out of 77 students (that is, 34%) Scoring a 1 - 15 out of 77 students (that is, 19%) Scoring a 0 - 0 students (0%) The target for success is met. We had 62 students (that is, 81%) of students with most to complete understanding. Analysis of Results and comments: With 81% of students assessed at complete or most understanding, overall we are pleased with the results. At this level, students tend to have strong study habits. We continue to emphasize with students the need to work diligently on assigned homework problems. Using collaborative activities in class can help students strengthen their own understanding by explaining the problem solving process and techniques to their peers. We hope to continue emphasizing conceptual understanding of the ideas being studied in addition to the mathematical procedures to help students solve application problems.	**Action:** Since we observed an over 80% rate of success, we hope in the future to assess a different variety of differential equations problem (perhaps focusing on a different application such as population dynamics or temperature). Perhaps we increase the rigor of the problem as well. (01/19/2017) **Action Category:** SLO/PLO Assessment Process

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	constant.) Biologists have determined that for the species depending on the pond water, the pollution level must be decreased to 1% (or less). c) What is the rate that the plant can discharge pollutants if this level is to be reached in 5 years? **Standard and Target for Success:** We set a success target of 65% on this SLO (that is, 65% of students scoring a 2 or 3 on the rubric scale). We use the following rubric scale: Score of 3 - Student solves all 3 parts of the problem correctly. Score of 2 - Student solves 2 of the 3 parts of the problem correctly. Score of 1 - Student solves 1 of the 3 parts of the problem correctly. Score of 0 - Student is unable to solve any portion of the problem. **Additional Information:**	Instructor Comments: The students did OK, but not as well as I had hoped. No student was totally clueless, but several students did not understand the concept as well as they should have done. We did a variety of application problems in class, but for many students they appeared to concentrate more on the differences in the problems rather than on the properties they had in common. In the future I would like to be able to spend more time on this topic. I currently spend ½ week on applications of differential equations, but since the course meets only twice a week, this comes to one class period. It would be nice if the students had a chance to try some of the problems and then discuss them in the next class as well, but the time constraints and the amount of material that must be covered make this difficult. The students met my expectations. This is a common differential equation problem in the course. We did examples in class and there were many homework problems that look similar to the SLO question. So I think the students were well-prepared for the SLO assessment. I went through two examples of this type in class thoroughly, and it really helped students understand the process to setup and solve these equations well. (01/19/2016) **% of Success for this SLO:** **Faculty Assessment Leader:** J Evensizer **Faculty Contributing to Assessment:** J Evensizer, A Minasian, J Ng	
SLO #3 GRAPHS - Students will use graphical techniques to solve differential equations or systems of differential equations. **Course SLO Status:** Active	**Exam/Test/Quiz -** Sketch the slope field for the given differential equation: dy/dt = y(1-y)(2-y)	**Semester and Year Assessment Conducted:** 2016-17 (Fall 2016) **Standard Met? :** Standard Met We collected data from 93 students in Math 270. The results were as follows:	**Action:** With such a high success rate measured in Fall 2016, we would like to increase the difficulty level of the assessment in the future. Perhaps using a

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Course SLO Assessment Cycle: 2016-17 (Fall 2016) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	Be sure the equilibrium solutions are clearly shown. Classify whether each equilibrium solution is stable, unstable, or semi-stable. Alternative Problem (related to Laplace Transform of step function): Use Laplace Transforms to solve the initial value problem: y'' + y = g(t), y(0)=0, y'(0)=1 Where g(t) is the pictured function. In addition to the algebraic representation of your solution y(t), please also ketch the graph of y(t). **Standard and Target for Success:** Our target for success is 65% (that is, at least 65% of all assessed students earning a score of 2 or 3 as indicated by the rubric below. Score of 3 – Slope field in the ty plane is very clear and detailed – with equilibrium solutions clearly shown and all correctly identified as stable, unstable or semistable. Score of 2 – Most understanding is present but perhaps behavior of the slopes is not as detailed as a '3' graph. Score of 1 – An attempt at the ty slope field graph is made but several errors are present such as incorrect slope directions and incorrect	Score of 3: 40 students (43% of those assessed) Score of 2: 33 students (35% of those assessed) Score of 1: 18 students (19% of those assessed) Score of 0: 2 students (2% of those assessed) Our target of success was met with a 78% success rate on this SLO assessment. Overall we were pleased with the results. Using a variety of tested problems (including slope field, Laplace transform with step function, and phase plane analysis), we get some variety in results. One instructor commented that assessment on the slope field problem went very well while the phase plane analysis did not end up as well. Specific instructor comments: J. Evensizer: (Assessing Laplace Transform) They met my expectations. This was a fairly simple problem. What disappointed me was the number of students who made no attempt to draw the graph of their solution. (I was also disappointed in the number of students who drew the graph correctly, but didn't label anything adequately.) To be fair, in class, I only did a couple of examples where I bothered to draw a graph of the solution and the text doesn't ask for a graph at all. A few more examples would help. They also had difficulties with making sure the arguments of the functions matched. (This is not significant as far as the graphing component of the problem went, but is a significant part of the actual problem.) S. Taylor: The emphasis on phase planes of 2nd-order, linear, homogeneous equations with constant coefficients, and systems of two 1st-order linear homogeneous systems with constant coefficients, and connecting the six basic shapes with the eigenvalues seemed very effective. Every student scored a 3 (good understanding) on this problem. Clearly, I need to use the same emphasis on the	more involved phase plane analysis or similar applied problem to assess student understanding of graphical methods in differential equations. (02/04/2019) **Action Category:** Curriculum Changes

Course SLOs	Assessment Method Description	Results	Actions
	identification of stability of equilibrium solutions. Score of 0 – Student has no understanding of construction of the ty slope field graph. **Additional Information:**	1st-order autonomous equations. I think I make the assumption that this is easier and does not need as much time. This I have learned is not the case. (02/04/2017) **% of Success for this SLO:** **Faculty Assessment Leader:** Z. Marks **Faculty Contributing to Assessment:** S. Taylor, J. Evensizer, A. Minasian	
SLO #4 PROOFS - Students will analyze and construct proofs relevant to differential equations and linear algebra. **Course SLO Status:** Active **Course SLO Assessment Cycle:** 2017-18 (Fall 2017) **Input Date:** 11/21/2013 **Inactive Date:** **Comments::**	**Exam/Test/Quiz -** Assess whether students can prove that the set of all solutions of a homogeneous differential equation forms a subspace of the vector space of infinitely many differentiable functions. **Standard and Target for Success:** BASED ON RUBRIC BELOW: It is expected that 80% of students will score 2 or 3 on this SLO. Scoring Rubric: Score 0 will be given to students who did not show any relevant work. Almost everything about the problem is incorrect. Score 1 will be given to students who are aware that the subspace W needs to be closed under vector addition and scalar multiplication, but they do not know how to prove the properties. Score 2 will be given to students who prove that the subspace W is closed under vector addition and scalar multiplication, but there are some minor mistakes in their proofs.	**Semester and Year Assessment Conducted:** 2017-18 (Fall 2017) **Standard Met? :** Standard Met 103 students were assessed, and the results are below. 6 (6%) students scored 0(No understanding); 11(11%) students scored 1(Some understanding); 61 (59%) students scored 2 (Most understanding); 25 (24%) students scored 3 (Complete understanding). 83% of students scored 2 or 3, and thus we conclude that the majority of the students understand that the set W of linear homogeneous differential equations forms a subspace. Therefore, the majority of students know how to analyze and construct the proof relevant to differential equations and linear algebra. (12/20/2017) **% of Success for this SLO:** 83 **Faculty Assessment Leader:** Paul Yun **Faculty Contributing to Assessment:** Paul Yun, Jim Stein, Ashod Minasian **Related Documents:** Math 270-F17-SLO combined.docx	**Action:** In the high level mathematics course Math 270 Differential Equations with Linear Algebra, the effective teaching method is introducing and explaining concepts, showing several examples through clear and well organized class lectures, and providing practice exercises that students try out first and class reviews together later. Using several different sets of linear homogeneous differential equations, help students see how to prove that each set forms a subspace, and then make sure that students try out practice exercises themselves enough so that they can master the concepts. (12/20/2017) **Action Category:** Teaching Strategies **Follow-Up:** Apply suggested teaching strategies in classroom, and find out whether there is any future improvement in the student performance in proving the set of linear homogeneous differential equations forms a subspace . (12/20/2017)

Course SLOs	Assessment Method Description	Results	Actions
	Score 3 will be given to students who prove that the subspace W is closed under vector addition and scalar multiplication with no mistake. **Additional Information:** In order to earn score 3, proof needs to be properly written and logical.		