



El Camino College  
COURSE OUTLINE OF RECORD – Approved

**I. GENERAL COURSE INFORMATION**

**Subject and Number:** Mathematics 180  
**Descriptive Title:** Precalculus  
**Course Disciplines:** Mathematics  
**Division:** Mathematical Sciences

**Catalog Description:**

This course is a preparation for calculus. Topics of study include polynomial, rational, exponential, logarithmic, trigonometric, and inverse functions. Matrices and analytic geometry are introduced, as well as sequences and series. The application of these topics is stressed to enhance conceptual understanding of the material.

*Note: The maximum UC credit allowed for students completing Mathematics 180 and Mathematics 130 is one course.*

**Conditions of Enrollment:**

**Prerequisite:** Mathematics 170 with a minimum grade of C or qualification by appropriate assessment

<b>Course Length:</b>	<b>X Full Term</b>	<b>Other (Specify number of weeks):</b>
<b>Hours Lecture:</b>	<b>5.00 hours per week</b>	<b>TBA</b>
<b>Hours Laboratory:</b>	<b>0 hours per week</b>	<b>TBA</b>
<b>Course Units:</b>	<b>5.00</b>	

**Grading Method:** Letter  
**Credit Status:** Associate Degree Credit

**Transfer CSU:** X Effective Date: Prior to July 1992  
**Transfer UC:** X Effective Date: Prior to July 1992

**General Education:**  
**El Camino College:**

**CSU GE:**

**IGETC:**

## II. OUTCOMES AND OBJECTIVES

### A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

#### 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.

#### 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.

#### SLO #3 GRAPHS

Students will create, interpret and analyze the graphs of polynomial, rational, exponential, logarithmic, trigonometric, parametric, polar and conic equations.

#### SLO #4 PROOFS

Students will analyze and construct proofs, including proofs by induction.

### B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Analyze functions (including polynomial, algebraic, rational, exponential, logarithmic, trigonometric) for critical features, including: intercepts, asymptotes, domain, range, and average rate of change.
2. Determine the inverse of a function (polynomial, algebraic, rational, exponential, logarithmic, trigonometric) and analyze it in terms of critical features.
3. Graph relations (including polynomial, rational, exponential, logarithmic, trigonometric functions and conics), using transformations (shifting, stretching, reflection).
4. Determine functions (including polynomial, rational, exponential, logarithmic, trigonometric) that model data.
5. Solve equations involving polynomial, rational, exponential, logarithmic, trigonometric functions.
6. Use polar and parametric functions to solve a variety of problems.
7. Use arithmetic and geometric series and sequences to solve a variety of problems.
8. Use matrices and systems of equations to solve a variety of problems.
9. Solve application problems using the topics of the course.
10. Use technology (graphing, scientific calculators or computer software) to solve problems.

**III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)**

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	5	I	ALGEBRAIC EXPRESSIONS, EQUATIONS and INEQUALITIES A. Factorization and simplification of expressions with fractional exponents B. Simplification of compound rational expressions C. Solutions of linear and nonlinear inequalities
Lecture	10	II	FUNCTIONS A. Graphs of functions including piecewise-defined functions; domain and range B. Transformations of functions; even and odd functions C. Increasing and decreasing functions D. Maxima and minima of quadratic functions E. Average rate of change; simplifying the difference quotient F. Composition of functions and their domains G. One-to-one functions, inverse functions, and graphs of inverse functions H. Applications and modeling using quadratic and other functions
Lecture	12	III	POLYNOMIAL AND RATIONAL FUNCTIONS A. Graphs of polynomial and rational functions B. Polynomial long division and synthetic division C. The Remainder Theorem and The Factor Theorem D. Determination of the real and complex zeros of polynomial equations E. The Fundamental Theorem of Algebra F. Complex numbers G. Analysis of extreme behavior of functions (i.e. asymptotes of rational functions)
Lecture	12	IV	EXPONENTIAL AND LOGARITHMIC FUNCTIONS A. Defining, evaluating, and simplifying exponential and logarithmic functions B. Solving exponential and logarithmic equations C. Graphs of exponential and logarithmic functions D. Modeling application problems using exponential and logarithmic functions
Lecture	15	V	TRIGONOMETRIC FUNCTIONS A. Unit circle trigonometry B. Defining, evaluating, and simplifying trigonometric expressions C. Finding solutions to trigonometric equations D. Graphs of trigonometric functions and their transformations (amplitude, period, and phase shift)

			<ul style="list-style-type: none"> <li>E. Trigonometric identities, including the addition, subtraction, double-angle, and half-angle formulas.</li> <li>F. Inverse trigonometric functions</li> <li>G. Applications and modeling using trigonometric functions</li> </ul>
Lecture	12	VI	<p>SYSTEMS OF EQUATIONS AND MATRICES</p> <ul style="list-style-type: none"> <li>A. Solutions to systems of equations and inequalities (linear and nonlinear)</li> <li>B. Introduction to matrices</li> <li>C. The algebra of matrices</li> <li>D. Solutions to systems of equations using matrices</li> <li>E. Determinants</li> <li>F. Partial Fraction Decomposition</li> </ul>
Lecture	12	VII	<p>ANALYTIC GEOMETRY</p> <ul style="list-style-type: none"> <li>A. Defining, evaluating, and graphing polar equations</li> <li>B. Converting between polar coordinates and rectangular coordinates</li> <li>C. Defining, evaluating, simplifying conics</li> <li>D. Graphs of conics and their transformations</li> <li>E. Defining, evaluating and graphing parametric equations</li> </ul>
Lecture	12	VIII	<p>SEQUENCES, SERIES AND MATHEMATICAL INDUCTION</p> <ul style="list-style-type: none"> <li>A. Sequences and series</li> <li>B. Arithmetic and geometric sequences and series</li> <li>C. Mathematical induction</li> <li>D. Binomial Theorem</li> </ul>
Total Lecture Hours		90	
Total Laboratory Hours		0	
Total Hours		90	

#### IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

##### A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

##### B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

Determine all primary solutions of the following trigonometric equation. Use a calculator and round all answers to four decimal places:

$$12\sin^2(x) - \sin(x) - 6 = 0$$

**C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:**

1. Consider the rational function below. Find all asymptotes and intercepts. Graph the function.

$$f(x) = \frac{x^2 - 2x - 80}{x^2 - 14x + 40}$$

2. A farmer has 200 feet of fencing to be used to construct a rectangular garden next to a barn. It will have three sides: one side will parallel to the barn and two sides will be perpendicular to the barn. There will also be two inner fences that are perpendicular to the barn. Write a function  $A(x)$  that models the area of all of the enclosed regions as a function of  $x$ , the length of the side that is parallel to the barn. What value of  $x$  will maximize the area of the garden?

**D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:**

- Objective Exams
- Other exams
- Quizzes
- Homework Problems

**V. INSTRUCTIONAL METHODS**

- Discussion
- Lecture

**Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.**

**VI. WORK OUTSIDE OF CLASS**

- Study
- Answer questions
- Required reading
- Problem solving activities

**Estimated Independent Study Hours per Week: 10**

**VII. TEXTS AND MATERIALS**

**A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS**

Stewart, James, et al. PRECALCULUS: Mathematics for Calculus, 7<sup>th</sup> Edition. Cengage, 2017.

**B. ALTERNATIVE TEXTBOOKS**

**C. REQUIRED SUPPLEMENTARY READINGS**

**D. OTHER REQUIRED MATERIALS**

## VIII. CONDITIONS OF ENROLLMENT

### A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Mathematics-170	Sequential

### B. Requisite Skills

Requisite Skills
1. Solve problems involving right triangle trigonometry. MATH 170 - Solve problems using angles and right triangles.
2. Solve trigonometric equations MATH 170 - Prove trigonometric identities and solve trigonometric equations.
3. Solve basic application problems using trigonometry. MATH 170 - State the laws of sines and cosines and solve problems involving non-right triangles.

### C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
-------------------------	----------------------------

### D. Recommended Skills

Recommended Skills
--------------------

### E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact
-------------------------------------	-------------------------------

Course created by Boxer, Nelson, Vedder on 12/01/1978.

BOARD APPROVAL DATE:

LAST BOARD APPROVAL DATE: 12/21/2020

Last Reviewed and/or Revised by Michael Bateman on 10/20/2020