Mathematics 170
Gateway Help Sheet - Graphs and Equations of Trigonometric Functions

This sheet provides you with information as you work toward achieving 90% proficiency on this gateway. As you go through the key ideas below, try to create a realistic picture of what you understand and what you don’t - the first attempt at the gateway should help. While preparing for the second attempt, if necessary, take full advantage of working with others, seeking help from friends, other students, tutors in the Math Study Center and your instructor. **NO CALCULATOR ALLOWED ON THIS GATEWAY**

1. **Solving an equation of the form** \( a \sin(x) = b \)
   In problems 1 through 4 you will be solving a trigonometric equation. In these problems you may want to make a graph to help determine how many solutions there are in the interval \( 0 \leq x \leq 2\pi \). In problems 1, 2 & 3 you will find all the solutions in the interval \( 0 \leq x \leq 2\pi \). In problem 1 the only transformation will be a possible change in amplitude.
   
   Example: \( 2 \sin(x) = -1 \)

2. **Solving an equation of the form** \( a \sin(bx) = c \)
   In this problem there may be two transformations: a possible change in amplitude and a change in period.
   
   Example: \( 2 \cos\left(\frac{x}{2}\right) = 1 \)

3. **Solving an equation of the form** \( a \sin(x + b) = c \)
   In this problem there may be two transformations: a possible change in amplitude and a phase shift.
   
   Example: \( 2 \cos\left(x + \frac{\pi}{4}\right) = 1 \)

4. **Solving an equation of the form** \( \sin(ax + b) = c \)
   In this problem there will be two transformations: a phase shift and a period change. You will be asked to find just one solution.
   
   Example: Find one solution that satisfies \( \sin\left(3x + \frac{\pi}{2}\right) = \frac{1}{2} \)

5. **Find the amplitude and period from an equation.**
   In this problem you will be given the equation of a trigonometric function. You will be asked to find the amplitude and period for the function.
   
   Example: Given \( f(x) = -3 \cos(\pi x + 1) \), find the amplitude and the period

6. **Find the amplitude and period from a graph.**
   In this problem you will be given the graph of a trigonometric function. You will be asked to find the amplitude and period for the function.
   
   Example: Find the amplitude and the period for
7. Graph a trigonometric function from an equation of the form \( y = a \sin(bx) \)

In problems 7 & 8 you will be given a grid and an equation of a trigonometric function. You will be asked to graph the equation. In this problem the equation will involve a possible change in amplitude and a change in period.

Example: Graph \( y = 0.75 \cos(3x) \)

![Graph of y = 0.75 cos(3x)](image)

8. Graph a trigonometric function from an equation of the form \( y = a \sin(x + b) \)

In this problem the equation will involve a possible change in amplitude and a phase shift.

Example: Graph \( y = 1.5 \sin(x - \pi) \)

![Graph of y = 1.5 sin(x - pi)](image)

9. Find an equation of a trigonometric function from its graph.

In this problem you will be given the graph of a trigonometric function. The graph will show enough scale for you to determine an equation.

Example: Find an equation for the graph below.

![Graph](image)

10. Find an equation of a trigonometric function from its graph.

In this problem you will be given the graph of a trigonometric function. There will be no x-scale given, but you will be given the period in addition to the equation.

Example: Find the equation of the graph below given that its period is 2.

![Graph](image)