Curriculum Units and Learning Outcomes

Content Area: Honors Pre-Calculus	Grade Level: 11 - 12

Unit 2: Trigonometric Graphs

Unit Summary: Students will learn how to graph Sine, Cosine and Tangent functions from an equation and conversely write a periodic equation from a graph. Students will learn how to find the inverse of a trig function, including how and why the range of an inverse trig function is limited. Students will apply the periodicity of a trig function so that inputs can be restricted to quadrant one while representing an angle in any quadrant.

Massachusetts Standards:

- **PC.F-TF**
  A. Extend the domain of trigonometric functions using the unit circle.
    - +) Use special triangles to determine geometrically the values of sine, cosine, tangent for ⁄3, ⁄4 and ⁄6, and use the unit circle to express the values of sine, cosine, and tangent for x, + x, and 2 x in terms of their values for x, where x is any real number.
    - (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.
  B. Model periodic phenomena with trigonometric functions.
    - (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.
    - (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

Enduring Understandings:
- Trigonometric functions are periodic. The sine and cosine have cyclic maximum and minimum values. Both properties are useful in modeling real world phenomena.
- The inverse trigonometric functions are useful when finding unknown angles. To make the inverses functional forms their range is restricted.
- Reference angles and the quadrant of the terminal side are used in finding the angle.
- Many real world problems involving periodic behavior can be modeled using trigonometric functions.

Essential Questions:
- How are the graphs of the trigonometric functions related to their functional forms?
- How does a periodic trigonometric function model real-world problems and their solutions?

Students will demonstrate KNOWLEDGE of:	Students will be SKILLED at:
- Periodicity of a periodic function. - The domain and range of the trig functions and how this affects the amplitude. - How the sine and cosine functions are the same and different. - How to graph a sine, cosine and tangent function by using their vertical and horizontal translations and shifts. - Students will be able to solve application problems involving trig functions.	- Students will be able to demonstrate shifts and stretches of trig graphs. - Graphing trigonometric functions - Writing a trigonometric equation from a graph. - Using their understanding of inverse trig functions and the restrictions on the range to find the angle of rotation for a given trig ratio and quadrant.

Estimated Duration: 3-4 weeks