

Lesson 4

Constructing Graphs of Trigonometric Functions

Class: Math IV or Accelerated Math III

Time: One 50-Minute Class Period

Goals:

- Students will construct the graphs of the six trigonometric functions geometrically. At least one example will be given to get students started on the exploration.
- Students will understand what it means when an input value and an output value are coordinated to create a function on the coordinate plane.
- Students will confirm their constructions are correct by plotting the functions in GSP.
- Students will compare and correct conjectures regarding the domain, range, signed domain, zeros, and angles for which the trig functions are undefined from the previous activity to the graphical representations they have created.
- Students will discover the periods of trigonometric functions.

GPS Standards Addressed:

- MM4A3. Students will investigate and use the graphs of the six trigonometric functions.
 - Understand and apply the six basic trigonometric functions as functions of real numbers.
 - Determine the characteristics of the graphs of the six basic trigonometric functions.
- MM4P4. Students will make connections among mathematical ideas and to other disciplines.
 - Recognize and use connections among mathematical ideas.
 - Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- MM4P5. Students will represent mathematics in multiple ways.
 - Create and use representations to organize, record, and communicate mathematical ideas.
 - Select, apply, and translate among mathematical representations to solve problems.

Supplies Needed:

- Computers with Geometer's Sketchpad Software
- Provided Procedure Worksheet

Assessment: Students will be assessed on the Procedure worksheet and Class Discussion. Out of 25 points, the breakdown is as follows.

- Participation in Class Discussion – 5 pts.
- Completion of Procedure Worksheet – 10 pts.
- Mathematical Reasoning Demonstrated in Procedure Worksheet – 10 pts.

Timeline:

- Introduction and Getting Started – 5 minutes
 - Be sure to emphasize that the radian measure of the angle is controlled by the free point x .
- Exploration Using the Procedure – 25 - 35 minutes
 - It may be useful to walk students through the cosine example so that students understand how they are to construct the locus for each ratio.
 - Students will be working independently or in small groups on the assigned tasks in the procedure.
 - During this time the instructor should be walking around the room. Assistance on questions may be given when necessary during this activity; encourage collaboration to arrive at solutions.
- Class Discussion – 10 to 20 minutes
 - Ensure that proper mathematical terminology is being used and that the terminology is understood.
 - Using the teacher file, walk through the construction of each of the loci.
 - Emphasize and discuss the coordination aspect of the loci construction.
 - Discuss the comparison of the results of this activity to the previous activity.
 - Discuss and emphasize the domains of the functions.
 - Discuss the ranges of the functions.
 - Discuss the periods of the functions.

- Discuss any questions that come up or portions of the activity that seem to be problematic for students.
- Discuss anything particularly interesting or unexpected that students have discovered in the exploration.