Graphs of the OTHER Trig Functions

Student Activity

Name _____

Class _____

Open the TI-Nspire document
*Graphs_of_the_OTHER_Trig_Functions.tns.*

You probably know a lot about sine, cosine and tangent, but you
may not know so much about the other trigonometric functions,
cotangent, secant, and cosecant. In this activity you will explore
those functions and learn what their graphs look like, and why they
look the way they do.

Move to page 1.3.

Press (ctrl) ▶ and (ctrl) ◀ to
navigate through the lesson.
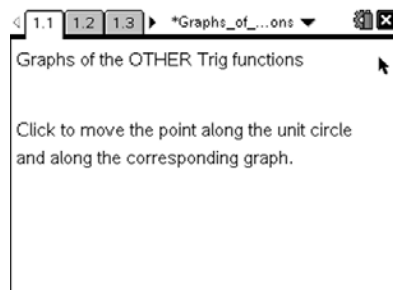
1. The screen shows a unit circle, and you can use the
    clicker to move a point around the circle, changing
    the angle θ.   Change the angle θ to be equal to 35°,
    as pictured on the right. This creates two triangles:
    The one on the top with one leg on the y-axis, one
    leg the bolded line, and the one on the bottom with
    one leg on the x-axis and one leg the dashed line.
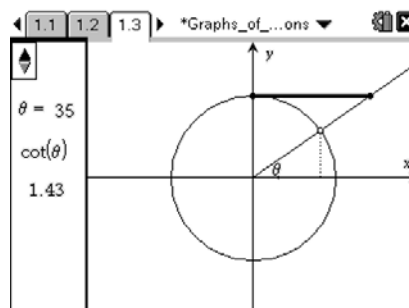
    a.   Prove that these are similar triangles.

    b.   Using the ratios of the non-hypotenuse side
         lengths, determine the length of the bolded side
         in terms of the other legs. Don't forget that you
         are working on a unit circle!

2.   You may now change the angle and explore on your own.
      a.   Recall that we can write the trig functions in terms of the sine and cosine functions.
           What is the cotangent function in terms of the sine and cosine functions?

      b.   Click to move the point around the circle. What does the bold line represent? How
           is it determined? How do you know?

      c.   For what values of θ is the cotangent 0? Undefined? How can you verify this?

      d.   Describe or sketch what you think the graph of the cotangent function might look
           like. Explain your thinking.

Move to page 2.2

3. The left hand side of the screen shows the unit circle from page 1.3 and the right side shows the graph of the cotangent function.

    a. How does the graph of the cotangent function compare to your description in question 1? If your prediction was incorrect, what do you think was your mistake?

    b. What happens as you click the arrow to change the value of θ? Why does the graph "jump" from one piece to another?

    c. Why does the graph repeat itself? How many times do you think this will happen? Why?

Move to page 3.2

4. a. Recall that we can write the trig functions in terms of the sine and cosine functions. What is the secant function in terms of the sine and cosine functions?

    b. Click to move the point around the circle. What does the bold line represent? How is it determined?

    c. For what values of θ is the secant 0? Undefined? How can you verify this?

    d. Describe or sketch what you think the graph of the secant function might look like. Explain your thinking.

Move to page 4.2

5. The left hand side of the screen shows the unit circle from page 3.2 and the right side shows the graph of the secant function.

    a. How does the graph of the secant function compare to your description in question 3? If your prediction was incorrect, what do you think was your mistake?

    b. What happens as you click the arrow to change the value of θ? Why does the graph "jump" from one piece to another? Why doesn't the graph ever cross the *x*-axis?

Move to page 5.2

6. a. How can you write the cosecant function in terms of the sine and cosine functions?

    b. Click to move the point around the circle. What does the bold line represent? How is it determined?

   c. For what values of θ is the cosecant 0? Undefined? How can you verify this?

   d. Describe or sketch what you think the graph of the cosecant function might look
like. Explain your thinking.

Move to page 6.2

7. How does the graph of the cosecant function compare to your description in question
5? Explain.

8. Choose one of the three trig functions from this activity. How could you use the graphs
of sine and cosine to graph that function? Explain.