Spaghetti Waves

Name:_____

The unit circle shows us how the sine and cosine ratios change as our angle increases. Today we're going to look at the sine and cosine as functions that input angles and output ratios and graph them!

1. We used special right triangles with a hypotenuse of length 1 to create the unit circle. Which leg on the right triangle represented the sine? Which leg represented the cosine?
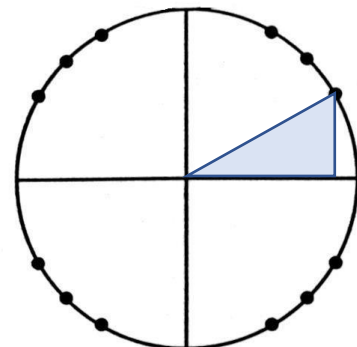
2. We'll start by looking at the function $y = \sin \theta$.
   a. What is the independent (input) variable? What is the dependent (output) variable?

   b. For each input, use the raw spaghetti to measure the length of the side associated with the sine ratio on the unit circle. Break the spaghetti to match this length. Then glue this length onto the graph at the corresponding angle, perpendicular to the x-axis. (Hint: If the sine value is negative, where should you glue the piece of spaghetti?)
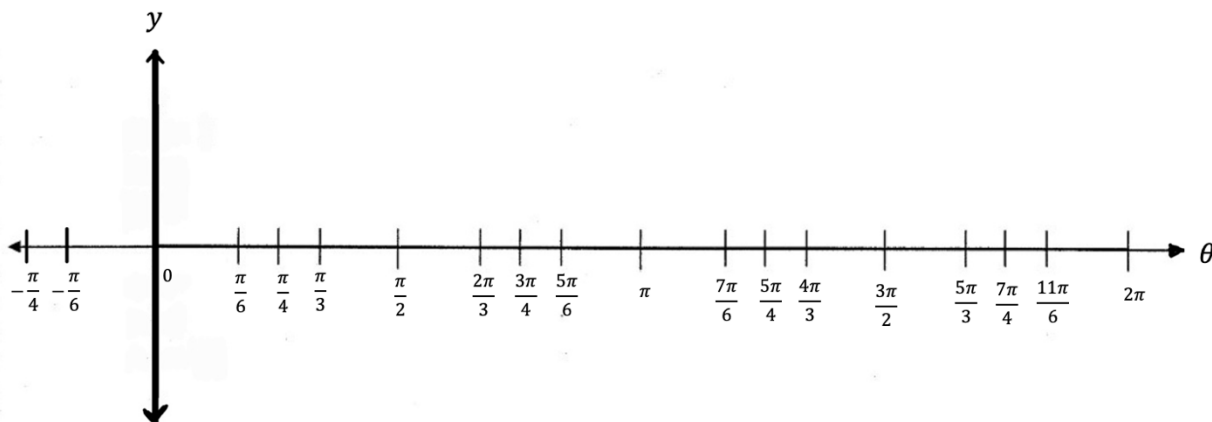
3. Label the exact value on the y-axis where each piece of spaghetti ends.
4. Use your pencil to make a smooth curve that connects the ends of the spaghetti. What do you notice about the shape of the curve? Why does this happen?

5. What is the highest and lowest point on your graph?

6. How long does it take until the graph starts repeating?

CALC MEDIC

7. Now we'll look at the function $y = \cos\theta$.
   a. What is the independent variable? What is the dependent variable?

   b. For each input, use the raw spaghetti to measure the length of the side associated with the cosine ratio on the unit circle. Break the spaghetti to match this length. Then glue this length onto the graph at the corresponding angle, perpendicular to the x-axis.
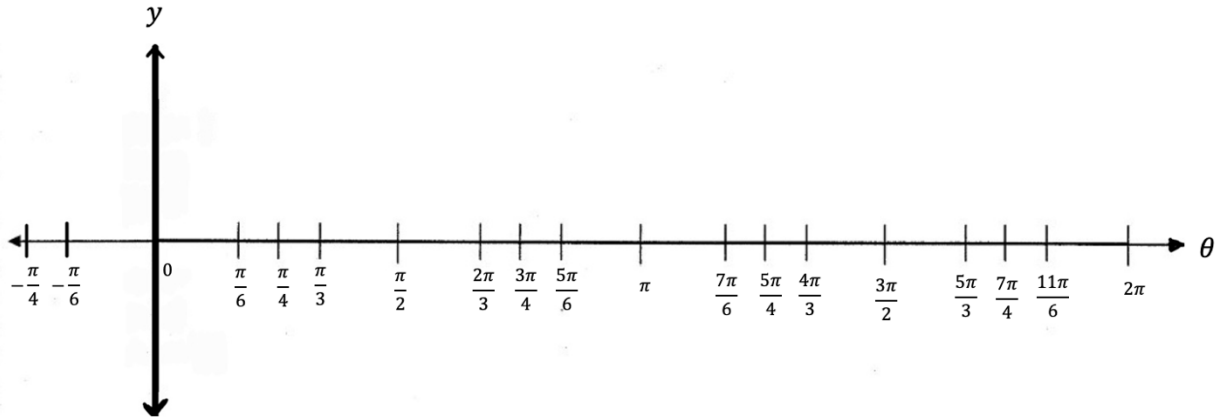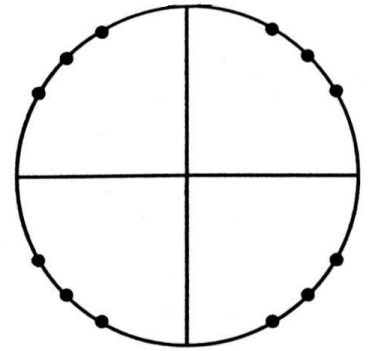
8. Label the exact value on the y-axis where each piece of spaghetti ends.
9. Draw the smooth curve that goes through the ends of the spaghetti.
10. What is the highest and lowest point on your graph?

11. How long does it take until the graph starts repeating?

12. What do the graphs of the sine and cosine functions have in common? How are they different?

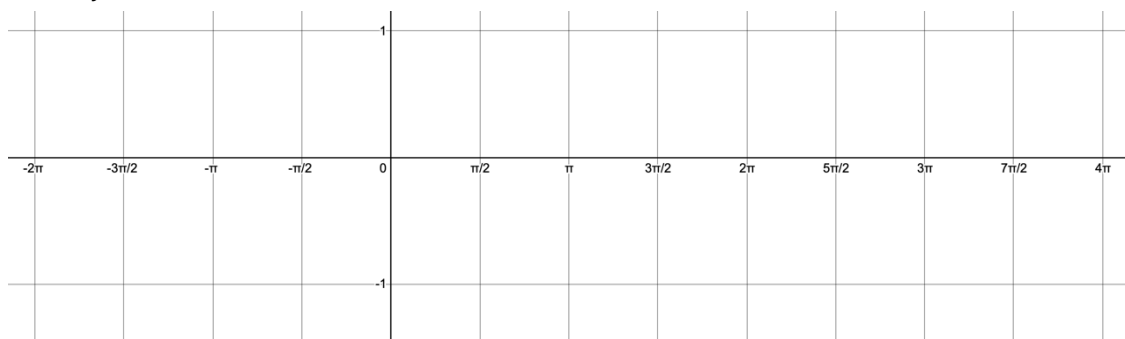13. Sketch $y = \cos\theta$ for $-2\pi \le \theta \le 4\pi$.

CALC MEDIC
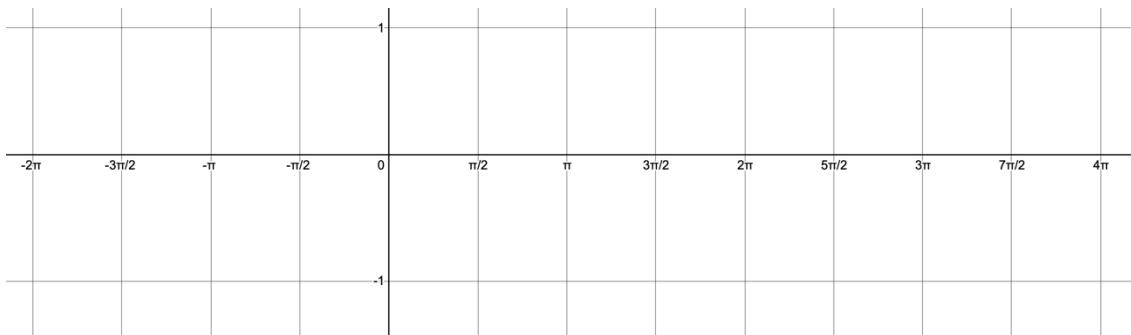
Important Ideas:

Check Your Understanding!

1. Sketch $y = \sin \theta$ for $-2\pi \leq \theta \leq 4\pi$.

| -2π | -3π/2 | -π | -π/2 | 0 | π/2 | π | 3π/2 | 2π | 5π/2 | 3π | 7π/2 | 4π |

2. Explain why the range of both the sine and cosine function is $[-1,1]$.

3. Is $y = \cos \theta$ an even function, an odd function, or neither? How do you know?

4. Is $y = \sin \theta$ an even function, an odd function, or neither? How do you know?

5. Which of the following statements is FALSE about the function $f(x) = \cos x$? Explain your reasoning.

A) $f(x) = f(-x)$

B) $f(x)$ has a y-intercept of 1.

C) The x-axis represents the cosine ratio.

D) $f(146\pi) = 1$

CALC MEDIC