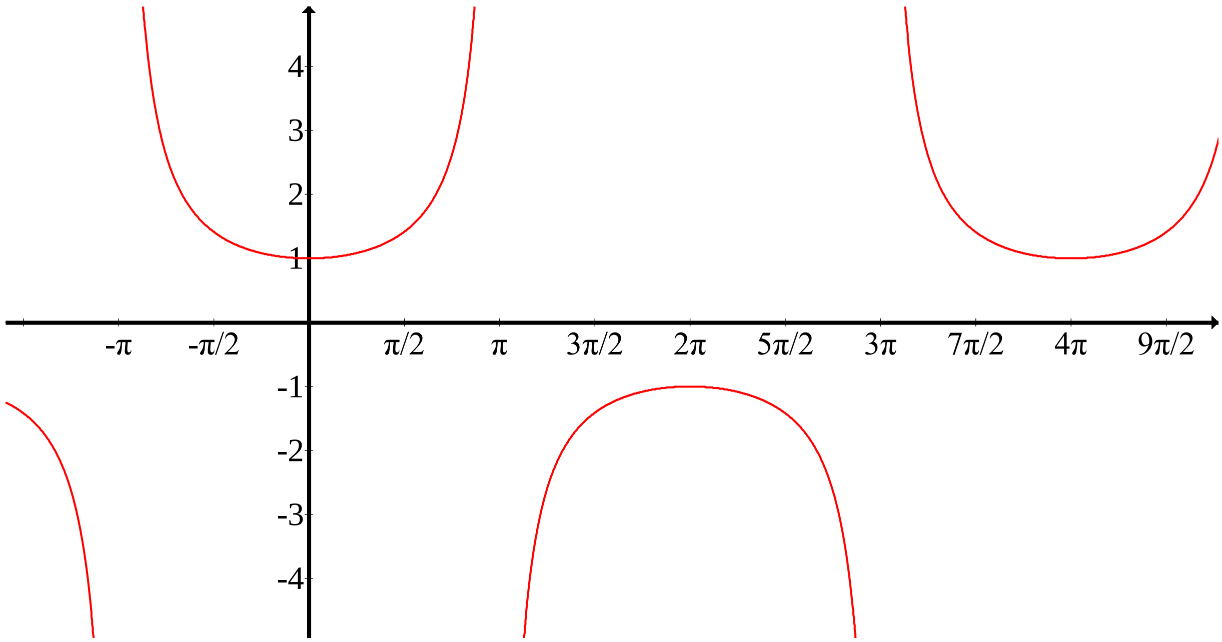
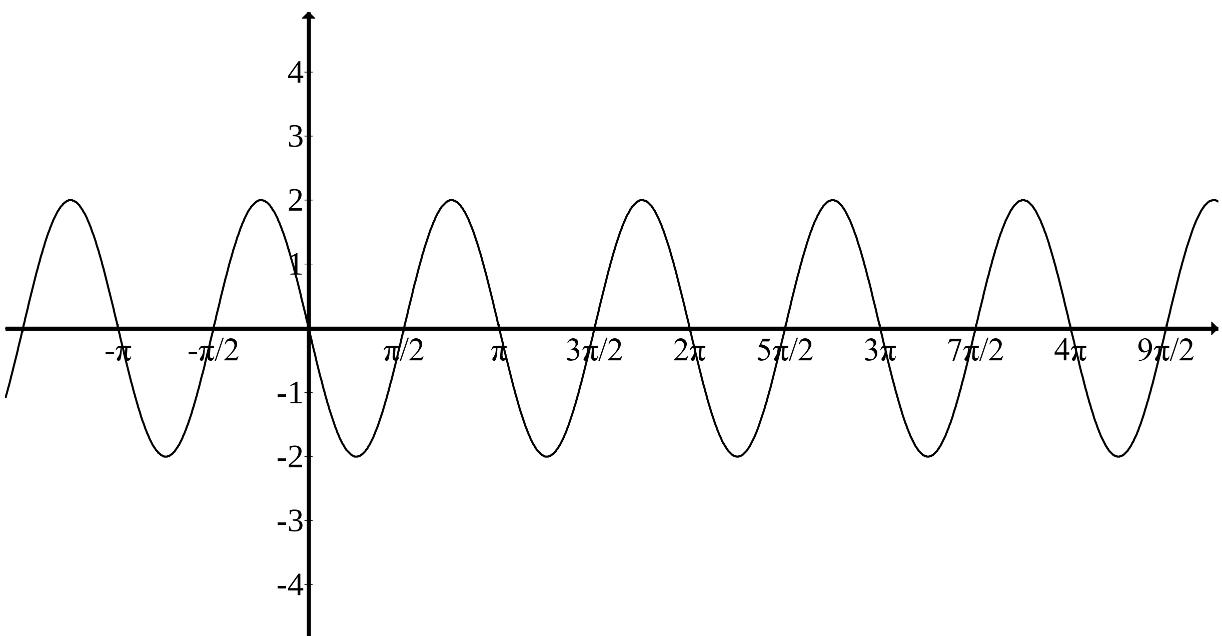
Name ___Solutions____ Trigonometry Quiz 5

1) On the axis below, graph the function $y = \sec\left(\frac{1}{2}x\right)$



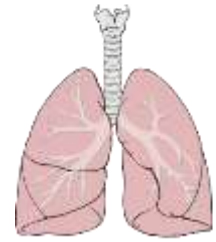
2) Find an equation for the graph shown below.



$y = -2\sin(2x)$

$y = 2\cos\left(2\left(x - \frac{3\pi}{4}\right)\right)$

$y = 2\cos\left(2\left(x + \frac{\pi}{4}\right)\right)$



3) The volume of air, v, in cubic centimeters in the lungs of a certain distance runner is modeled by the equation $v = 300\sin(60\pi t) + 800$, where t is time measured in minutes.

(a) What is the maximum volume of air in the runner's lungs?

The air in the runner's lungs is given by $300\sin(60\pi t) + 800\ cm^3$, and we know that $300\sin(60\pi t)$ gets as large as 300, so plugging this in we find the maximum volume to be:

$$300 + 800\ cm^3 = 1100\ cm^3$$

(a) What is the minimum volume of air in the runner's lungs?

At first glance we can say that definitely it's at least $0\ cm^3$, but actually we can say more. When we look at the equation $300\sin(60\pi t) + 800$ we know that $300\sin(60\pi t)$ can get as small as -300, so we plug this in and find the minimum volume to be:

$$-300 + 800\ cm^3 = 500\ cm^3$$

In fact the runner's lungs never run out of air!

(c) How many breaths does the runner take each minute?

A breath would be one cycle from fully inflated, $1100\ cm^3$ to fully inflated again at $1100\ cm^3$. Because the equation is sinusoidal, this occurs every time $60\pi t$ goes through 2π. Let's see when this is:

$$60\pi t = 2\pi$$

$$t = \frac{2\pi}{60\pi} = \frac{1}{30}$$

Every $1/30^{th}$ of a minute the runner takes a breath. That means the runner takes 30 breaths every minute.

OR

t is measured in minutes, so set $t = 1$ and see how many cycles of 2π the runner goes through:

$$\frac{60\pi \cdot 1}{2\pi} = 30 \text{ breaths per minute}$$