Unit 8 Practice Test #1
Learning Targets: 8A and 8B

Complete the problems below, show your work, and write your answer in the blank provided.

This is a non-calculator test!

<u>Learning Target 8A</u>: I can graph and solve problems involving the sine and cosine functions, including their transformations.

1. Find the amplitude, period, and phase shift of $f(x) = -3\sin(2x - 9) + 3$.

$$f(x) = -3\sin\left(2\left(x - \frac{9}{2}\right)\right) + 3$$

$$amp = 3, \qquad period = \frac{2\pi}{2} = \pi, \qquad phase\ shift = \frac{9}{2}$$

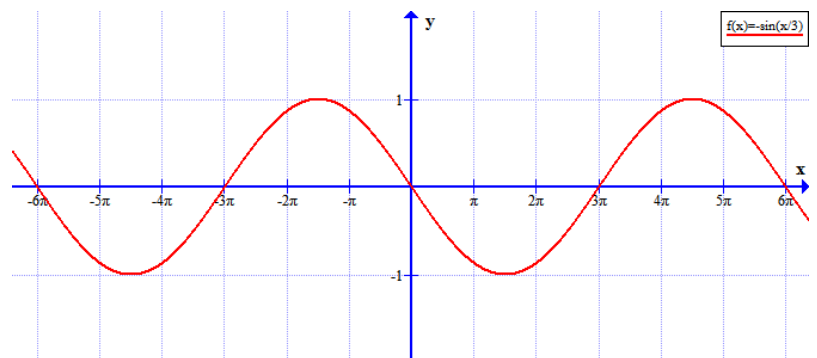2. Write an equation of the cosine function with amplitude 2 and period 4π.

$$f(x) = 2\cos\left(\frac{1}{2}x\right)$$

3. Find the amplitude, period, phase shift, and vertical shift of $y = 3\sin(2x - \pi) + 2$.

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

$$amp = 3, \qquad period = \pi, \qquad phase\ shift = \frac{\pi}{2}, \qquad vert.\ shift = 2\ (up)$$
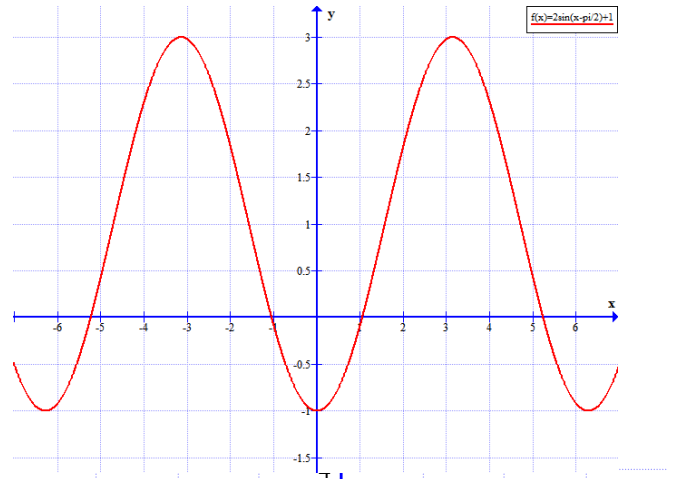
4. Graph two periods of $f(x) = -\sin\left(\frac{x}{3}\right)$.

5. Graph two periods of $f(x) = 2\sin(x - \frac{\pi}{2}) + 1$.
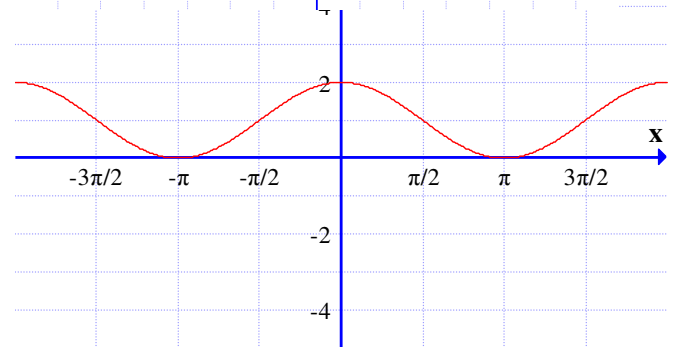
amp $= 2$

per $= 2\pi$

6. Consider the graph to the right.
   a) Write a *cosine* function that would have the graph to the right.

   $y = \cos x + 1$

   b) Write a *sine* function that would have the graph to the right.
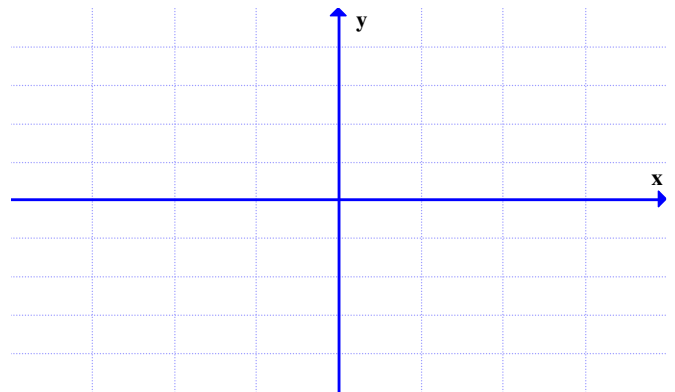 $y = \sin(x + \frac{\pi}{2}) + 1$

7. Consider the function $g(x) = 3\sin\left(x - \frac{\pi}{2}\right) + 2$.
   a) Describe the transformations of $y = \cos(x)$ to make this graph.

   Amp=3, phase shift $= \frac{\pi}{2}$ right,
   *Vertical shift $=$ up 2*

   b) Graph $g(x)$ to the right.

8. A signal buoy in the Chesapeake Bay bobs up and down with the height h of its transmitter (in feet) above sea level modeled by $h = a \sin bt + 5$. During a small squall its height varies from 1 ft to 9 ft and there are 3 sec from one 9-ft height to the next. What are the values of the constants a and b?

   $a = 4$

   $b = \frac{2\pi}{3}$

9. A spring is mounted on a stand with a weight attached to it. We collect data over at .01 sec. intervals and record the height h (in meters) at time t as the ordered pair (t, h). Write the sinusoidal function for the spring if:
Max (.4 , 2.0)   Min (.6 , 0.2)
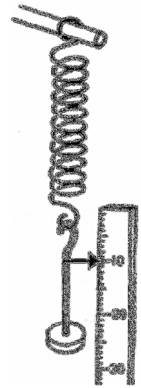
We will use a cosine function $h(t) = A \cos\big(B(x - C)\big) + D$

$$A = \frac{1}{2}(2.0 - 0.2) = 0.9$$

$$Period = 2(.6 - .4) = 2(.2) = .4$$

$$B = \frac{2\pi}{per} = \frac{2\pi}{.4} = \frac{20\pi}{4} = 5\pi$$

$$Phase\ Shift = C = 0.4\ because\ of\ maximum$$

$$D = \frac{1}{2}(2.0 + 0.2) = 1.1$$

$$h(t) = 0.9 \cos\big(5\pi(x - 0.4)\big) + 1.1$$

Learning Target 8B: I can graph and solve problems involving tangent, secant, cosecant, and cotangent functions, including their transformations.

10. What are the two equations for finding the vertical asymptotes of a tangent function?

$$x = \left(\frac{\pi}{2b}\right) + n\left(\frac{\pi}{b}\right), \qquad or \ \ x = \frac{(2n+1)\pi}{2b}, \qquad n \in \mathbb{Z}$$

11. What changes in the tangent pattern when the amplitude is negative?
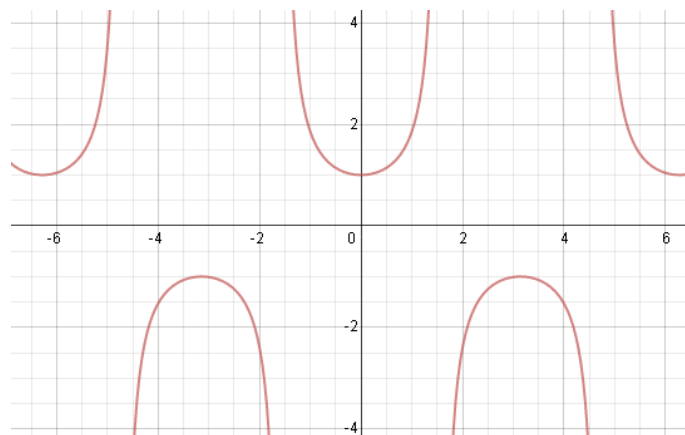
Vertical flip (i.e. curves go down to right)

12. Find the vertical asymptotes of $y = 3\tan x$.

$$x = \frac{\pi}{2} + n\pi$$

13. Write an equation of the tangent function with amplitude 2, vertical shift 1, and period 4.

$$y = 2\tan\left(\frac{\pi}{4}x\right) + 1$$

14. Graph $y = \csc(x + \frac{\pi}{2})$.
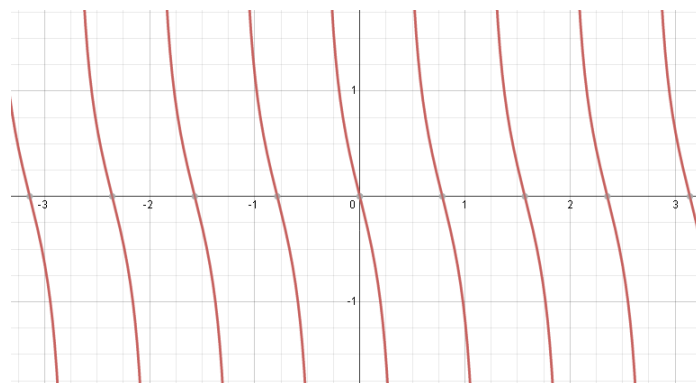

15. Consider the function $y = -\tan 4x$.
   a) Find the period and asymptotes

   per: $\frac{\pi}{4}$

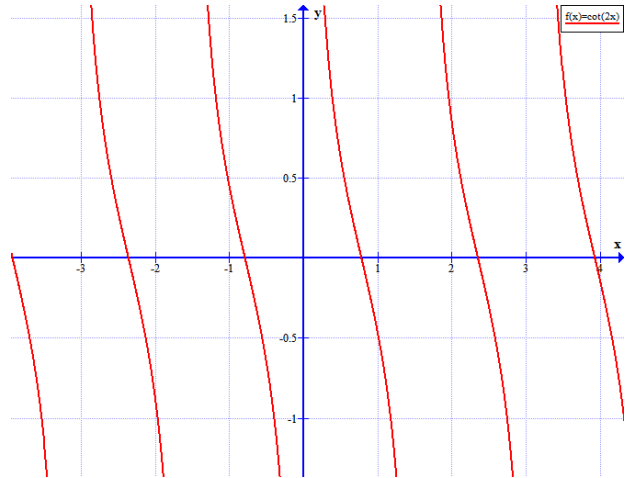   asymptotes: $x = \frac{1}{2}\left(\frac{\pi}{4}\right) + n\cdot\frac{\pi}{4} = \frac{\pi}{8} + \frac{n\pi}{4}$

   b) Graph the function

16. Find the period of $y = \cot 2x$ and graph the function (Be sure to indicate your scales.)

per:$\dfrac{\pi}{2}$

17. What other trigonometric function has the same set of asymptotes as the graph of $y = \cot x$? Explain your reasoning.

Since cotangent has asymptotes when sine is zero, and cosecant has asymptotes when sine is zero, cosecant and cotangent have the same asymptotes.

18. Explain the steps to write an equation for the graph to the right and write an equation.

A shifted cosine graph will hit the maximum and minimum of the curves. So
$$y = \sec\left(x + \frac{\pi}{4}\right)$$