Battaglia

Unit 5: Graphing Trig Functions & Applications Worksheet Omega

1. In a predator/prey model, the predator population is modeled by the function:

$p = 900\cos\left(\frac{2\pi}{3}\right)t + 8000$ where t is measured in years.

   a. Find the length of time between successive periods of maximum population.
   b. Sketch a graph that represents the given population model.
   c. What is the minimum population? When does this occur in the first cycle?

2. A variable star is one whose brightness alternately increases and decreases. For the variable star Nittany Minor, the time between periods of maximum brightness is 5.4 days. The average brightness of the star is 4.0, and its brightness varies by a magnitude of 0.35.

   a. If Champion Major is at its brightest at t =0, find a function that models the brightness as a function of time.
   b. At what point will the star be at its dimmest? What is its magnitude?
   c. What is the magnitude of brightness after 2 weeks?

3. The height in cm of the tip of a second hand on a vertical clock face varies as a function of time in seconds. The second hand is 20 cm long, and the middle of the clock face is 225 cm above the ground.

   a. Find a function to model the height of the second hand as a function of time assuming the hand is at the 9 o'clock position to start.
   b. How far above the ground is the tip of the second hand after 15 seconds?
   c. How far above the ground is the second hand when it reaches the 8 o'clock mark?
   d. Find the first time that the hand is 212 cm above the ground.

4. <u>Graph Two Cycles:</u>

   A) $y = 8\tan\frac{5}{8}x - 3$

   B) $f(x) = -9\cot\frac{7}{11}x + 6$

5. Graph One Cycle:

A) $y = 4\sin\left(\frac{2}{7}x + \frac{3\pi}{4}\right) - 2$

B) $f(x) = 2\cos\frac{9}{4}\left(x - \frac{\pi}{3}\right) + 5$

6. Find the number of times the line **y = 5** intersects the graph of $y = 4\cos 20x + 3$ over the interval $[0, 2\pi]$.

7. Given the following information – write the equation of the positive sine function in standard form:

** y – maximum = 12 **y – minimum = 2 **Endpoints of one cycle: $\left[-\frac{3\pi}{5}, \frac{\pi}{10}\right]$

8. Indicate the range of the function: $y = 5\csc\frac{2}{3}x + 1$

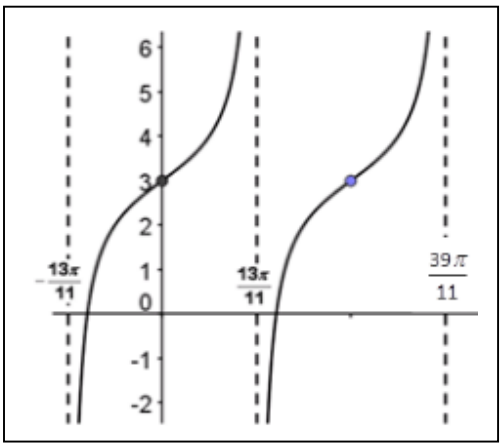
9. Explain the pattern for the location of the asymptotes for the graph of

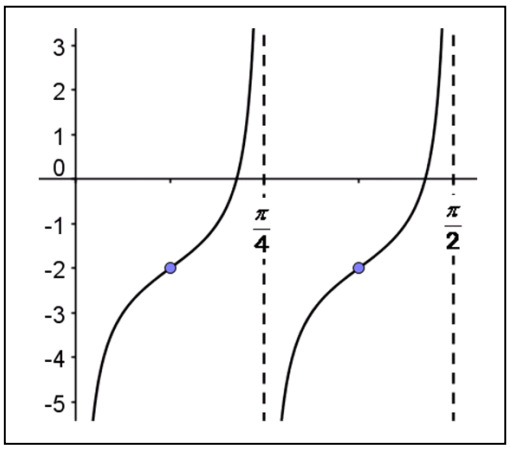
(A) $g(x) = 2\sec\frac{6}{7}x + 2$ (B) $y = -2\cot\frac{\pi}{3}x + 6$

10. Describe the transformations required to obtain the graph of y_2 from the graph of y_1.

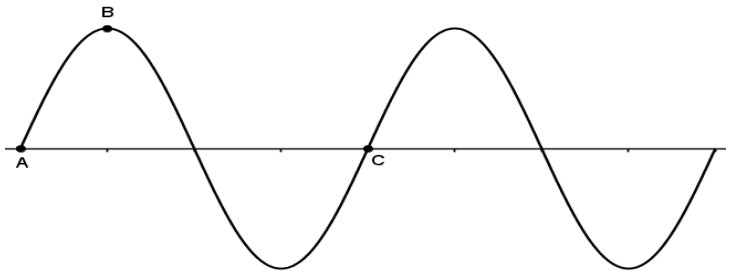
$$y_1 = 2\cos\left(x + \frac{\pi}{3}\right) - 1 \qquad \textit{and} \qquad y_2 = \cos\left(x + \frac{\pi}{4}\right)$$

11. Write the equation of the function in standard form for the given graphs. Assume no phase shift and no vertical stretch or compress.





In problems 12 & 13, the graphs of the sine and cosine functions are waveforms like the figure below. By correctly labeling the coordinates of points A, B, and C, you will get the graph of the function given.



12. *GIVEN*: $y = 3\cos 2x$ *and* $B = (0,3)$.
FIND the coordinates of A & C.

13. *GIVEN*: $y = 5\sin(3x - \pi)$ and A is the first x-intercept on the right of the y-axis.
FIND the coordinates of A, B & C.

14. On the same set of axes, graph the two equations below over the interval $[\mathbf{0}, \pi]$.
All key information should be easily found looking at your graph.

A) $y = 4\sin 4x$ B) $y = 3\cos 2x + 1$

i. How many times do the graphs intersect over this interval?
ii. Using your TI-Calc change the window settings so the graph resembles your work. Find the values of each intersection point.
iii. Find the linear equation (y = mx + b) from the first local max on the sine function and the second local min on the sine function.