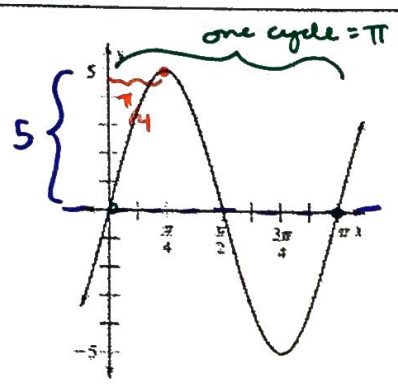
Precalculus Homework Name _____

4.5 Worksheet #2-Writing Equations of Sine and Cosine Functions

Examine the graph below and determine the amplitude, period, phase shift, and vertical shift of each using COSINE as the parent function. Then write an equation of the function.

1.



Amplitude: 5 $a=5$

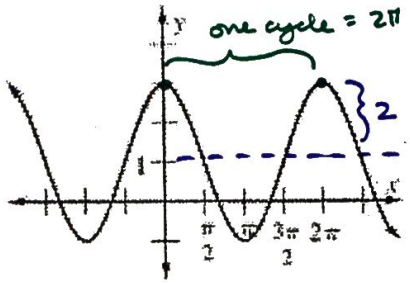
Period: π $\frac{2\pi}{b}=\pi \rightarrow 2\pi=\pi b$, $2=b$

Phase Shift: ~~none~~ $\pi/4$ (to the right) $\frac{c}{2}=\frac{\pi}{4}$, $c=\pi/2$

Vertical Shift: none $d=0$

Function: $y=5\cos(2x-\pi/2)$

2.



Amplitude: 2 $a=2$

Period: 2π $\frac{2\pi}{b}=2\pi \rightarrow 2\pi=2\pi b$, $1=b$

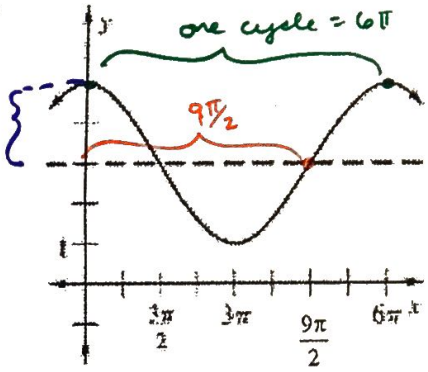
Phase Shift: none $c=0$

Vertical Shift: 1 (up) $d=1$

Function: $y=2\cos(x)+1$

Examine the graph below and determine the amplitude, period, phase shift, and vertical shift of each using SINE as the parent function. Then write an equation of the function.

3.



Amplitude: 2 $a=2$

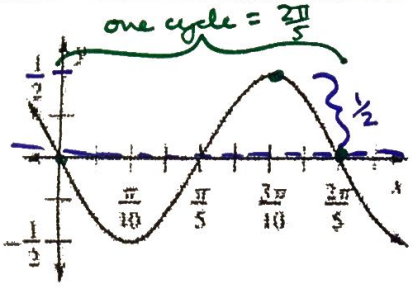
Period: 6π $\frac{2\pi}{b}=6\pi \rightarrow 2\pi=6\pi b$, $\frac{1}{3}=b$

Phase Shift: $\frac{9\pi}{2}$ (to the right)

Vertical Shift: 3 (up) $d=3$

Function: $y=2\sin(\frac{1}{3}x-\frac{9\pi}{2})+3$

4.



Amplitude: $\frac{1}{2}$ → reflect over x-axis, so $a=-\frac{1}{2}$

Period: $\frac{2\pi}{5}$ $\frac{2\pi}{b}=\frac{2\pi}{5} \rightarrow 2\pi=\frac{2\pi}{5}b$, $5=b$

Phase Shift: none $c=0$

Vertical Shift: none $d=0$

Function: $y=-\frac{1}{2}\sin(5x)$

Identify the amplitude, period, phase shift and vertical shift of the following trig functions.

5. $y = -10\cos\left(\frac{x}{6}\right)$

Amplitude: 10

Period: 12π $\quad \frac{2\pi}{b} = \frac{2\pi}{1/6} = 2\pi \cdot \frac{6}{1} = 12\pi$

Phase Shift: none

Vertical Shift: none

6. $y = 5 - 2\sin\left(\frac{2x}{3}\right) \rightarrow y = -2\sin\left(\frac{2}{3}x\right) + 5$

Amplitude: 2

Period: 3π $\quad \frac{2\pi}{b} = \frac{2\pi}{2/3} = 2\pi \cdot \frac{3}{2} = 3\pi$

Phase Shift: none

Vertical Shift: 5 (up)

7. $y = 3\cos(6x + \pi)$

Amplitude: 3

Period: $\pi/3$ $\quad \frac{2\pi}{6} = \frac{2\pi}{6} = \frac{\pi}{3}$

Phase Shift: $\pi/6$ (to the left)

Vertical Shift: none

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

Amplitude: 4

Period: 3π $\quad \frac{2\pi}{2/3} = 2\pi \cdot \frac{3}{2} = 3\pi$

Phase Shift: $\pi/2$ (to the right) $\quad \frac{\pi}{3} / \frac{2}{3} = \frac{\pi}{3} \cdot \frac{3}{2} = \frac{\pi}{2}$

Vertical Shift: none

Given the following information about each trig function, write a possible equation for each.

9. Sine Function

amplitude $= \frac{1}{2} = a$

period $= \frac{\pi}{3}$ $\quad \frac{2\pi}{b} = \frac{\pi}{3} \rightarrow 6\pi = \pi b$, $6 = b$

vertical shift $= -4 \rightarrow d = -4$

$\boxed{y = \frac{1}{2}\sin(6x) - 4}$

10. Sine Function

amplitude $= 7 = a$

period $= 4\pi$ $\quad \frac{2\pi}{b} = 4\pi \rightarrow 2\pi = 4\pi b$, $\frac{1}{2} = b$

phase shift $= -\frac{\pi}{3}$ $\quad \frac{c}{b} = -\frac{\pi}{3}$, $\frac{c}{1/2} = -\pi/3$, $c = -\pi/6$

$\boxed{y = 7\sin\left(\frac{1}{2}x - \frac{\pi}{6}\right)}$

11. Cosine Function

amplitude $= 1 = a$

period $= 2\pi$ $\quad \frac{2\pi}{b} = 2\pi \rightarrow 2\pi = 2\pi b$, $1 = b$

phase shift $= \frac{5\pi}{6}$ $\quad \frac{c}{1} = \frac{5\pi}{6} \rightarrow c = \frac{5\pi}{6}$

vertical shift $= 3 \rightarrow d = 3$

$\boxed{y = \cos\left(x + \frac{5\pi}{6}\right) + 3}$

12. Cosine Function

amplitude $= 3 = a$

period $= \pi$ $\quad \frac{2\pi}{b} = \pi \rightarrow 2\pi = \pi b$, $2 = b$

phase shift $= -\pi$ $\quad \frac{c}{2} = -\pi$, $c = -2\pi$

vertical shift $= -1.5$ $\quad d = -1.5$

$\boxed{y = 3\cos(2x - 2\pi) - 1.5}$