Name _____ Hour _____

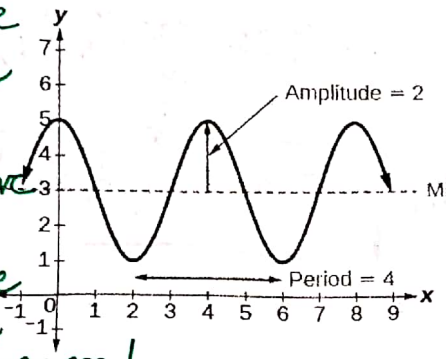
Classwork: Applications of Sine and Cosine Functions $y = a \sin/\cos(bx - c) + d$

1) For each of the following graphs find the amplitude, period, phase shift, vertical shift and the ending value for one full cycle of output values then write the equation of the graph.

trace
- cosine curve
- sine curve
- reflected cosine curve
- reflected sine curve

* depends on which curve you see!

a.



Per: $\frac{2\pi}{b}$ $4 = \frac{2\pi}{b}$

Amp = 2 Period = 4

* left endpt Phase Shift = 0 / -1

Vertical Shift = 3

* pt endpt Ending Value = 4

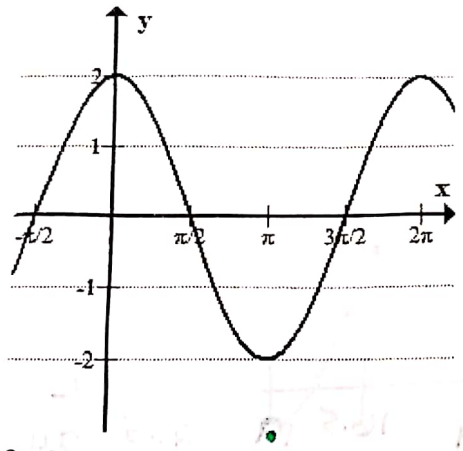
Equation $y = 2\cos\left(\frac{\pi}{2}x\right) + 3$

eqn: $a = 2$, $b = \frac{\pi}{2}$, $d = 3$

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

$2\sin(\pi/2 x + \pi/2) + 3$

b.



Amp = 2 Period = 2π $b = 1$

Phase Shift = 0 / $-\pi/2$

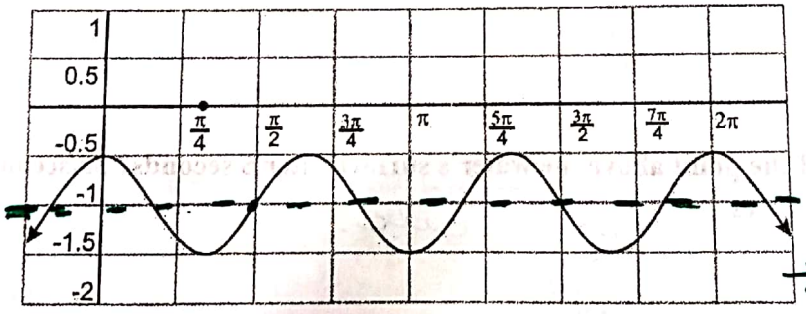
Vertical Shift = 0

Ending Value = 2π

Equation = $y = 2\cos x$

$y = 2\sin(x + \pi/2)$

c.



$\text{Amp} = \frac{M-m}{2}$

$\text{Vertical shift} = \frac{M+m}{2}$

→ How many cycles from 0 to 2π? $b = 3$

Amp = 0.5 Period = $2\pi/3$ Phase Shift = 0

Vertical Shift = -1 Ending Value = $2\pi/3$

Equation $y = \frac{1}{2}\cos(3x) - 1$

$y = \frac{1}{2}\sin 3\left(x - \frac{\pi}{2}\right) - 1$

$* y = \frac{1}{2}\sin\left(3x - \frac{3\pi}{2}\right) - 1$

$y = a \begin{matrix} \sin \\ \cos \end{matrix}(bx - c) + d$

Start at 4 sec ↓

2) **As the paddlewheel turned, a point on the paddle blade moved in such a way that its distance, *d*, from the water's surface was a sinusoidal function of time. When a stopwatch read 4 seconds the point was at its highest, 16 feet above the water's surface. The wheel's diameter was 18 feet and it completed a revolution every 10 seconds.** Per = 10 sec

$\frac{M-m}{2} = \frac{16+2}{2} = 9$

Amp = 9

Per = 10

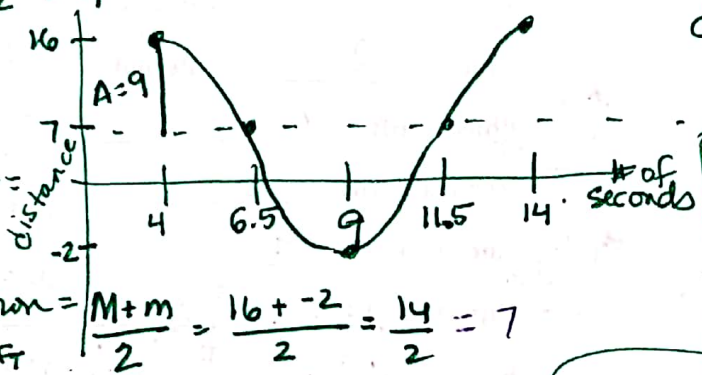
Phase shift =

Vertical translation = $\frac{M+m}{2} = \frac{16+-2}{2} = \frac{14}{2} = 7$

MAX = 16 Ft

MIN = −2

a.) Write a function that expresses the distance above the water's surface in terms of time.



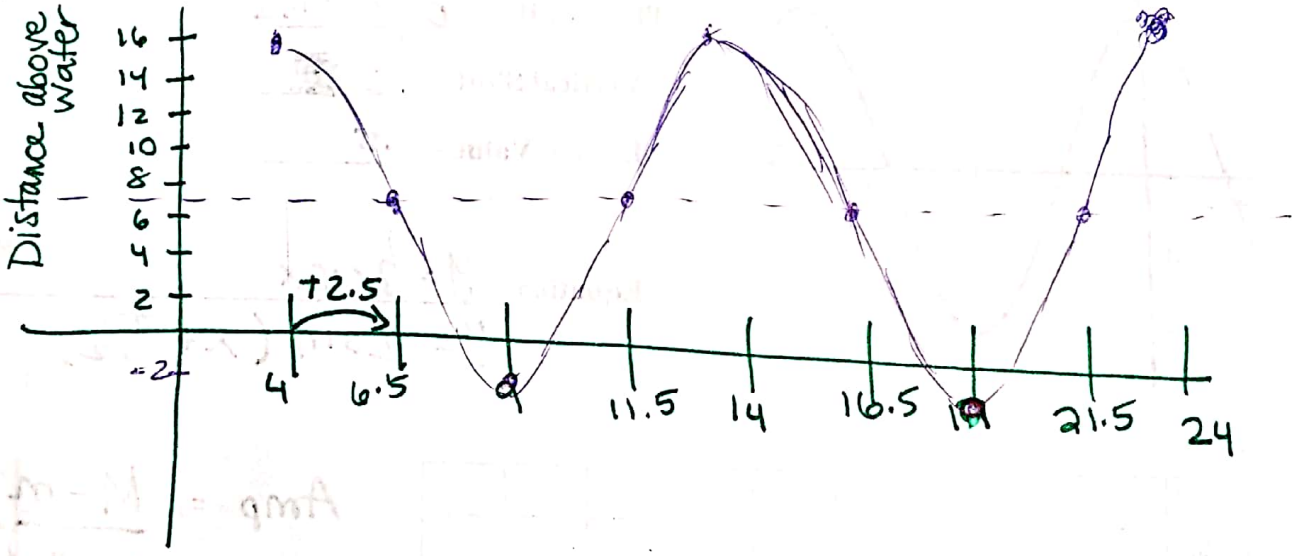
$d = 9\cos\left(\frac{2\pi}{10}(x-4)\right) + 7$

$\frac{\pi}{5}$

$d = 9\cos\left(\frac{\pi}{5}x - \frac{4\pi}{5}\right) + 7$ *

b.) Sketch the graph of the function for two full cycles of output values. Be sure to label the key points on the graph.

Do b First!



c.) What was the distance of the point above the water's surface after 5 seconds? 35 seconds? Round to three decimal places.

radian mode

Graphing calc.

$y = 9\cos\left(\frac{\pi}{5}x - 4\pi/5\right) + 7$

table set up

independent ask

$d(5) = 14.281$ FT

$d(35) = 14.281$ FT

d.) What were the first three times when the point was 9 feet above the water's surface? Round to three decimal places.

$y_2 = 9$ find intersection pts

$t \approx 1.857$ sec, 6.143 sec., 11.857 sec