



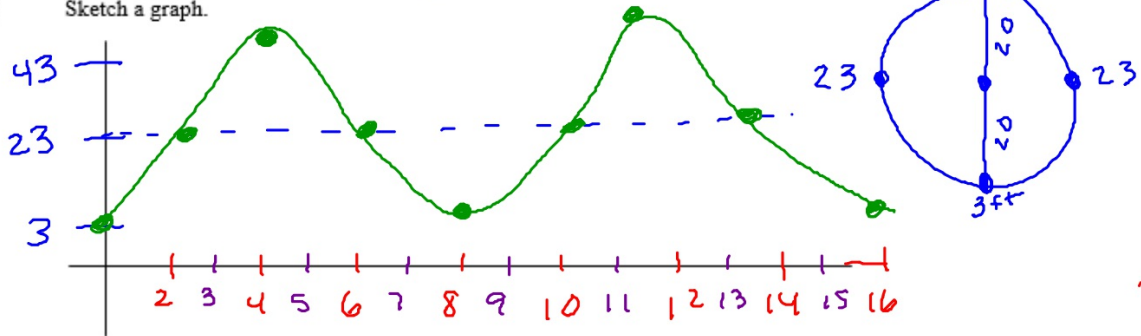
## 4.4 Graphing the Sine and Cosine Functions

**Homework:**  
**Finish Classwork**

- 1) As you ride the Ferris wheel, your distance from the ground varies sinusoidally with time. You are the last seat filled and the ferris wheel starts immediately. Let  $t$  be the number of seconds that have elapsed since the ferris wheel started. You find that it takes you 4s to reach the top, 43 ft. above the ground, and that the wheel makes a revolution once every 8s. The diameter of the wheel is 40 ft.

$$a=20 \quad b=2\pi/8 = \pi/4 \quad k=23$$

- a) Sketch a graph.



- b) What is the lowest you go as the ferris wheel turns, and why is this number greater than zero?

3ft. You start 3 feet off the ground

- c) Write an equation.

$$y = 20 \sin \pi/4 (x-2) + 23 \quad y = 20 \cos \pi/4 (x-4) + 23$$

- d) Predict your height above the ground when: 1)  $t=6$       2)  $t=13/3$       3)  $t=0$

23ft      42.32ft      3ft

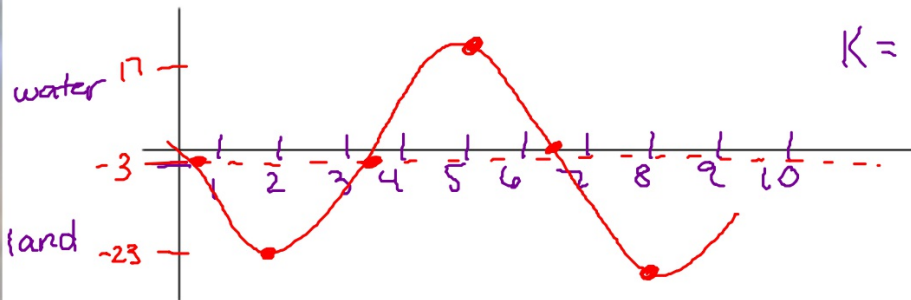
- e) What is the value of  $t$  the second time you are 18 ft above the ground?

6.32 seconds

### TARZAN PROBLEM

2) Tarzan is swinging back and forth on his grapevine. As he swings, he goes back and forth across the riverbank, going alternately over land and water. Jane decides to model mathematically his motion and starts her stopwatch. Let  $t$  be the number of seconds the stopwatch reads and let  $y$  be the number of meters Tarzan is from the riverbank. Assume that  $y$  varies sinusoidally with  $t$ , and that  $y$  is positive when Tarzan is over water and negative when he is over land. Jane finds that when  $t = 2$ , Tarzan is at one end of his swing, where  $y = -23$ . She finds when  $t = 5$  he reaches the other end of his swing and  $y = 17$ .

a) Sketch a graph.



$$a=20 \quad b=\frac{2\pi}{6}=\frac{\pi}{3}$$

$$K=-3$$

b) Write an equation expressing Tarzan's distance from the riverbank in terms of  $t$ .

$$y=20 \sin^{\pi/3}(x-3.5) - 3 \quad y=20 \cos^{\pi/3}(x-5) - 3$$

c) Predict  $y$  when:  $t = 2.8$

$$-16.38 \rightarrow 16.38 \text{ feet inland, } -13 \rightarrow 13 \text{ feet inland}$$

d) Where was Tarzan when Jane started the stopwatch?

$$7 \rightarrow 7 \text{ feet over the water.}$$

**OIL WELL PROBLEM**

3) The jack on an oil well goes up and down, pumping oil out of the ground. As it does so, the distance varies sinusoidally with time. At time = 1 sec, the distance is at its maximum, 3.7 meters. At time = 4 sec, distance is at its minimum, 1.5 m.

a) Sketch a graph.



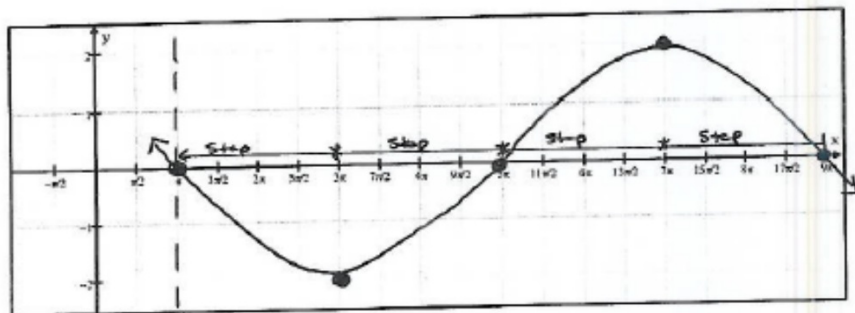
b) Write an equation.

c) Find the distance when time = 5.5 sec.

d) Find the first time when distance = 1.78m.

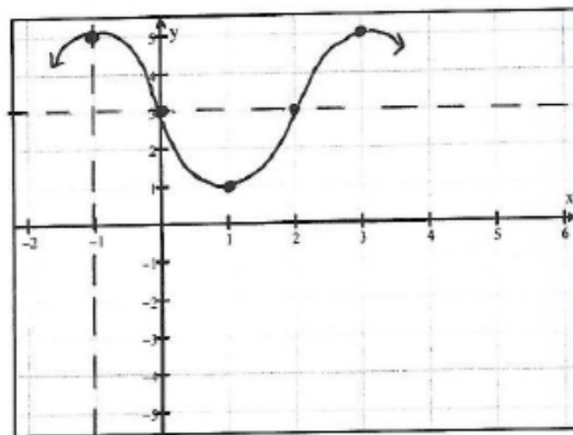
1.  $y = -2\sin\frac{1}{4}(x-\pi)$

Flipped?	YES
Amplitude =	2
Period = $\frac{2\pi}{b} = \frac{2\pi}{1/4} = 8\pi$	
Step = $\frac{8\pi}{4} = 2\pi$	
h (x-shift) =	$\pi$ Right
k (y-shift) =	0



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

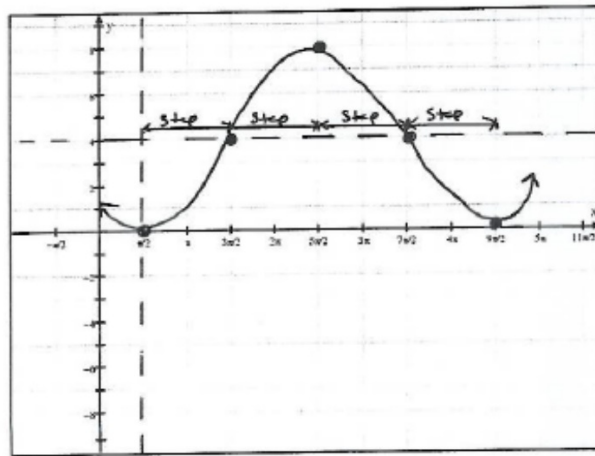
Flipped?	NO
Amplitude =	2
Period = $\frac{2\pi}{b} = \frac{2\pi}{\pi/2} = 4$	
Step = $\frac{4}{4} = 1$	
h (x-shift) =	1 to left
k (y-shift) =	3 up





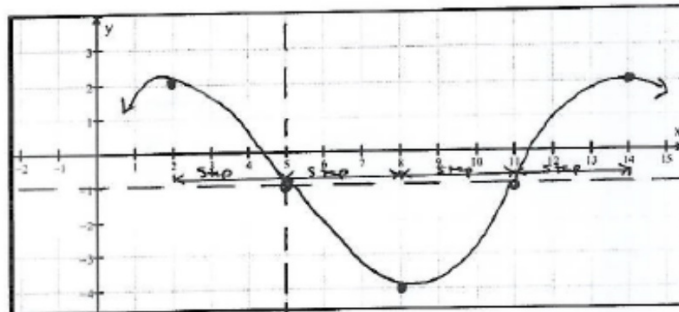
3.  $y = -4\cos\frac{1}{2}\left(x - \frac{\pi}{2}\right) + 4$

Flipped? <b>YES</b>
Amplitude = <b>4</b>
Period = $\frac{2\pi}{b} = \frac{2\pi}{1/2} = 4\pi$
Step = $\frac{4\pi}{4} = \pi$
h (x-shift) = $\frac{\pi}{2}$ to right
k (y-shift) = <b>4 up</b>



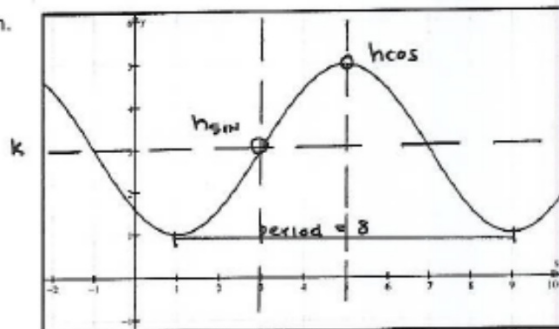
4.  $y = -3\sin\frac{\pi}{6}(x-5) - 1$

Flipped? <b>YES</b>
Amplitude = <b>3</b>
Period = $\frac{2\pi}{b} = \frac{2\pi}{\pi/6} = 12$
Step = $\frac{12}{4} = 3$
h (x-shift) = <b>5 to right</b>
k (y-shift) = <b>1 down</b>



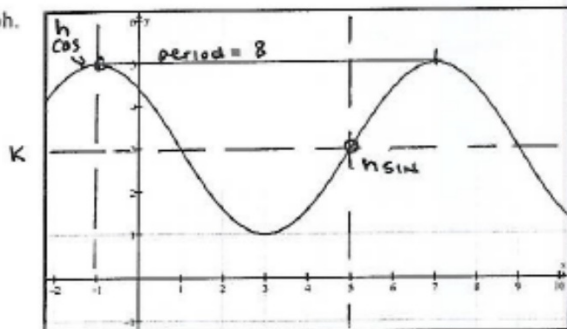
5. Write the Sine and Cosine equation for trigonometric graph.

$a = 2$	$h(\text{sine}) = 3$	Sine Equation $y = 2\sin\left(\frac{\pi}{4}(x-3)\right) + 3$
period = 8	$h(\text{cosine}) = 5$	Cosine Equation $y = 2\cos\left(\frac{\pi}{4}(x-5)\right) + 3$
$\frac{b}{2\pi} = \frac{\pi}{4}$	$k = 3$	



6. Write the Sine and Cosine equation for trigonometric graph.

$a = 2$	$h(\text{sine}) = 5$	Sine Equation $y = 2\sin\left(\frac{\pi}{4}(x-5)\right) + 3$
period = 8	$h(\text{cosine}) = -1$	Cosine Equation $y = 2\cos\left(\frac{\pi}{4}(x+1)\right) + 3$
$\frac{b}{2\pi} = \frac{\pi}{4}$	$k = 3$	



7. Write the Sine and Cosine equation for trigonometric graph.

$a = 2$	$h(\text{sine}) = \frac{\pi}{2}$	Sine Equation $y = 2\sin\left(\frac{1}{2}\left(x - \frac{\pi}{2}\right)\right) + 5$
period = $4\pi$	$h(\text{cosine}) = \frac{3\pi}{2}$	Cosine Equation $y = 2\cos\left(\frac{1}{2}\left(x - \frac{3\pi}{2}\right)\right) + 5$
$b = \frac{2\pi}{4\pi} = \frac{1}{2}$	$k = 5$	

