

## Section 11.8

Determine the amplitude, period, phase shift, and vertical shift for each.

1)  $y = 3 + 4\sin(x - \pi)$

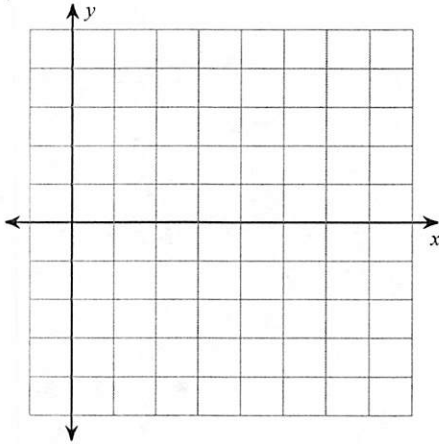
2)  $y = \frac{1}{2} \cdot \cos(2x - 4)$

3)  $y = 2\cos(x - \pi)$

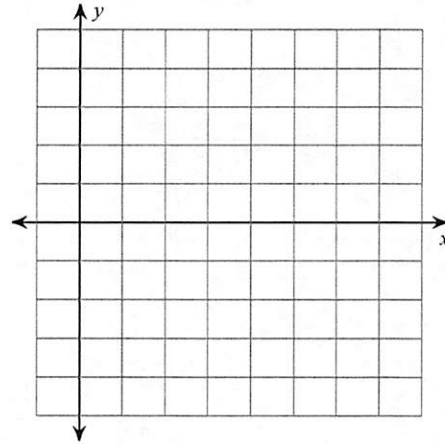
4)  $y = 2 + 3\sin\left(4x + \frac{\pi}{2}\right)$

Find the amplitude and period of each function. Then graph one full period using radians:

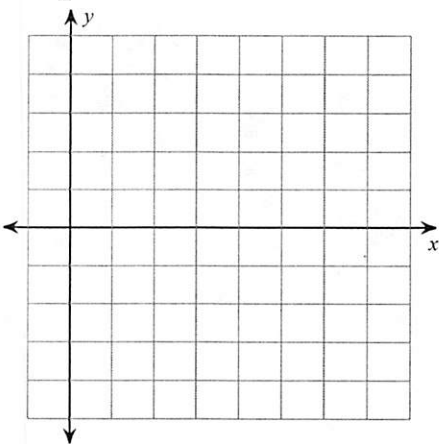
5)  $y = 2\sin 3\theta$



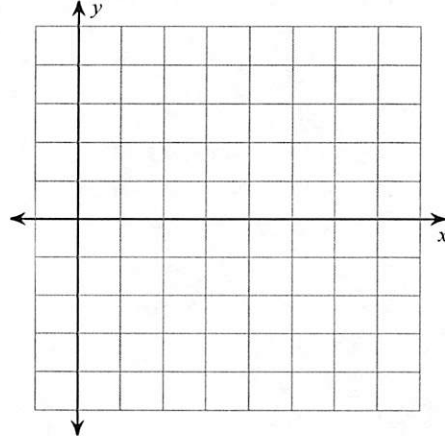
6)  $y = 2\cos\left(\theta - \frac{\pi}{4}\right)$



7)  $y = \frac{1}{2} \cdot \sin 3\theta + 1$

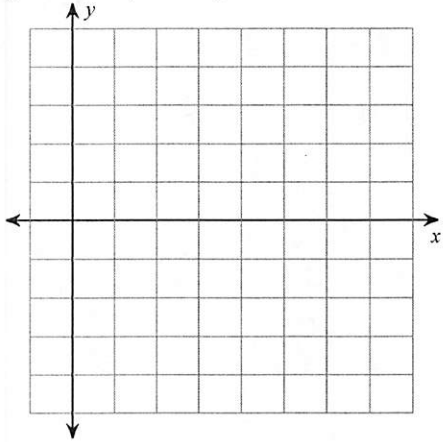


8)  $y = 3\cos 4\theta - 1$

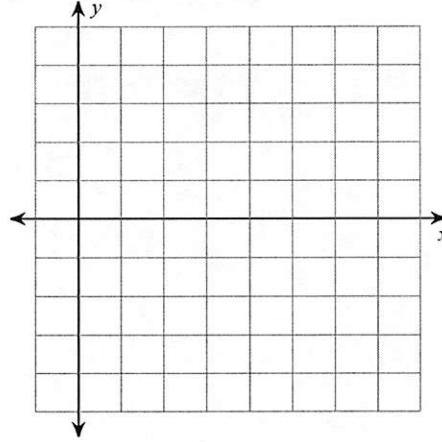


Find the amplitude and period of each function. Then graph one full period using degrees:

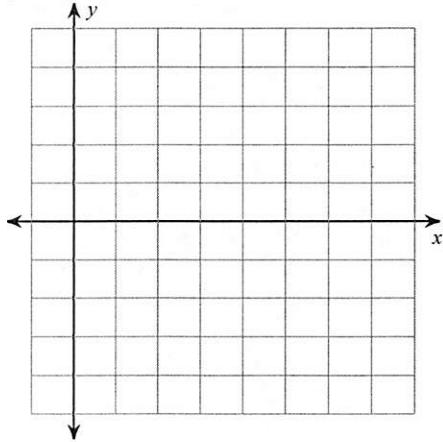
9)  $y = 3\cos(\theta + 45) - 1$



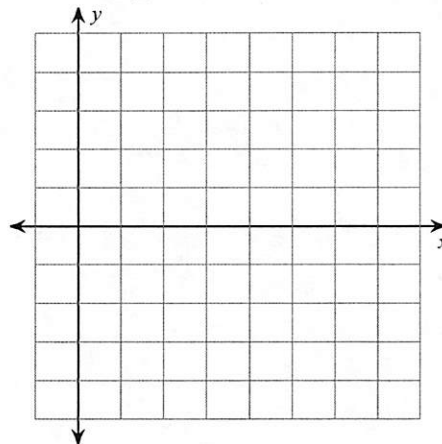
10)  $y = 4\cos(2\theta - 120) + 2$



11)  $y = -1 + 3\sin(2\theta - 60)$

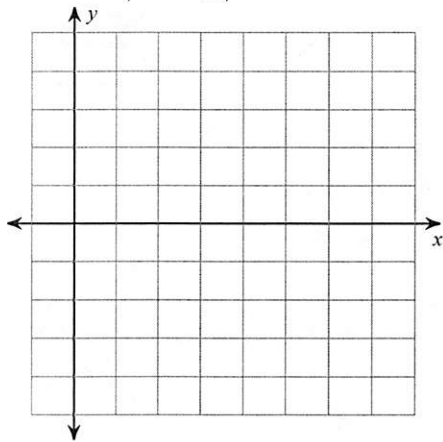


12)  $y = -2 + \frac{1}{2} \cdot \sin(3\theta + 90)$

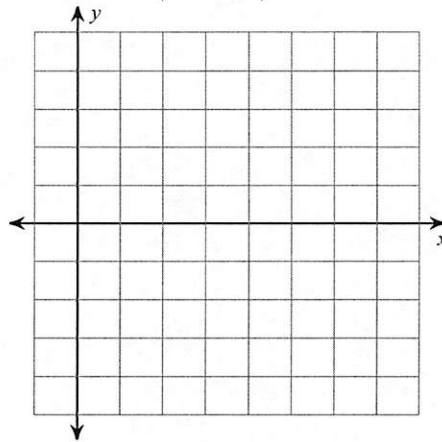


Find the amplitude and period of each function. Then graph one full period using radians:

13)  $y = 2\sin\left(4\theta + \frac{\pi}{2}\right) - 2$

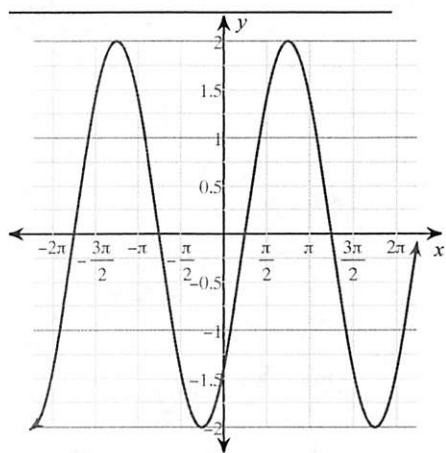


14)  $y = \frac{1}{2} \cdot \sin\left(\theta + \frac{3\pi}{4}\right) + 1$

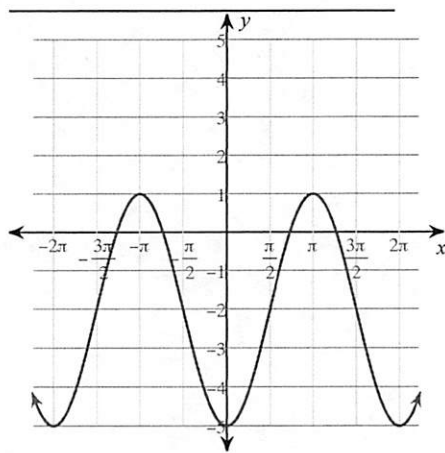


State the amplitude and period then find the equation of the trigonometric function given.

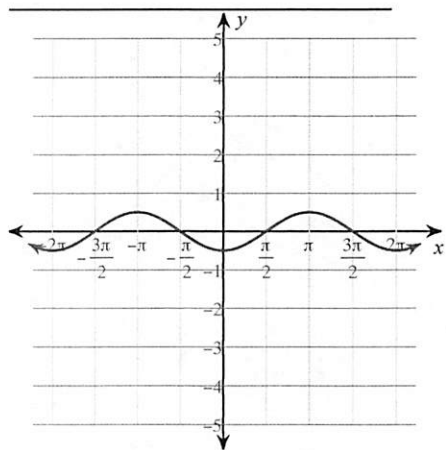
15)



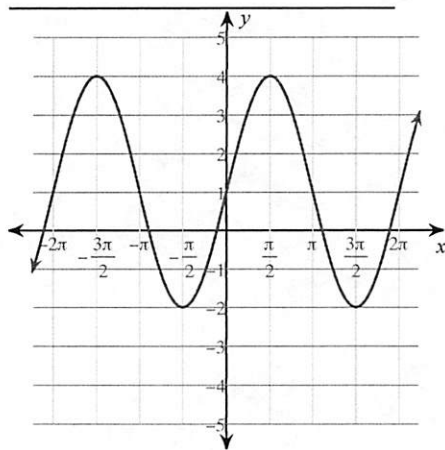
16)



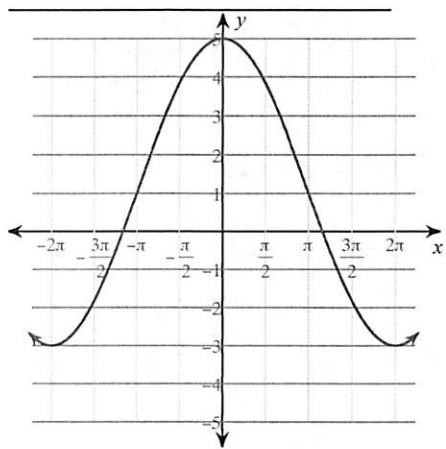
17)



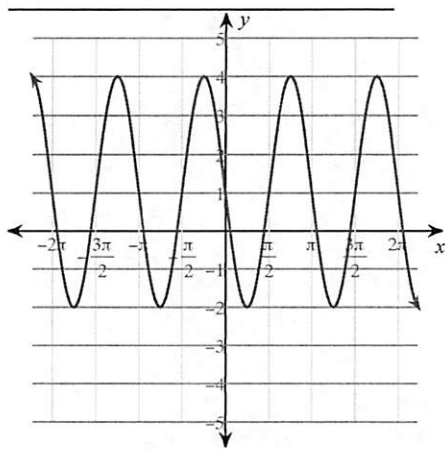
18)



19)



20)



21) Ecology: The population of an insect species in a stand of trees follows the growth cycle of a particular tree species. The insect population can be modeled by the function  $y = 40 + 5\sin\pi t$ , where  $t$  is the number of years since the stand was first cut.

a) What is the maximum insect population?

b) How often does the insect population reach its maximum (period)?

22) Along the coast, the tides are of particular interest. They are affected by the gravitational pull of both the moon and the sun. The high tides and low tides follow a periodic pattern that you can model with the sine function.

$$f(x) = 5\sin\frac{\pi}{4} \cdot t + 15 \text{ where } t \text{ is in hours.}$$

a) What is the time between each high tide (period)?

b) What is the highest level of the tide (max)?

c) What is the lowest level of the tide (min)?

23) A bicycle wheel with radius 14 inches has the bottom-most point on the wheel marked in red. The wheel then begins rolling down the street. The periodic function represented by the bicycle

wheel is  $f(x) = -14\cos\frac{1}{14} \cdot x + 14$

a) What is the diameter of the tire (Max height)?

b) How far does the wheel travel to complete one full rotation (period)?

Section 11.8

Determine the amplitude, period, phase shift, and vertical shift for each.

1)  $y = 3 + 4\sin(x - \pi)$

$a = 4$  p.s.  $\pi$  right  
 $p = 2\pi$  v.s. up 3

3)  $y = 2\cos(x - \pi)$

$a = 2$  p.s.  $\pi$  right  
 $p = 2\pi$  v.s. none

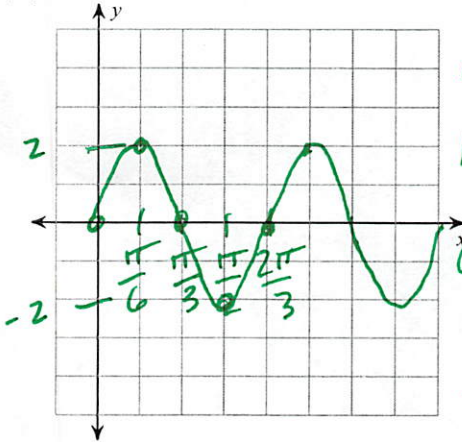
2)  $y = \frac{1}{2} \cdot \cos(2x - 4)$

$a = \frac{1}{2}$  p.s. = 2 right  
 $p = \pi$  v.s. none

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

Find the amplitude and period of each function. Then graph one full period using radians:

5)  $y = 2\sin 3\theta$

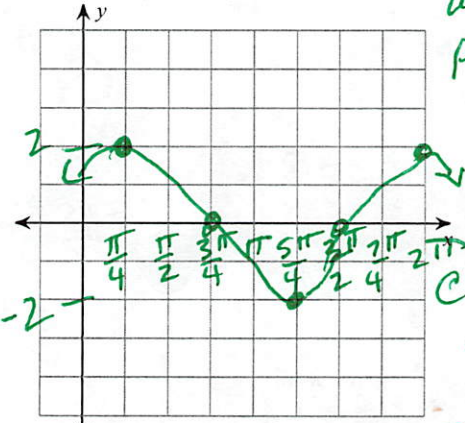


$a = 2$   
 $p = \frac{2\pi}{3}$

Critical points

$\frac{2\pi}{3} \cdot \frac{1}{4} = \frac{\pi}{6}$

6)  $y = 2\cos\left(\theta - \frac{\pi}{4}\right)$



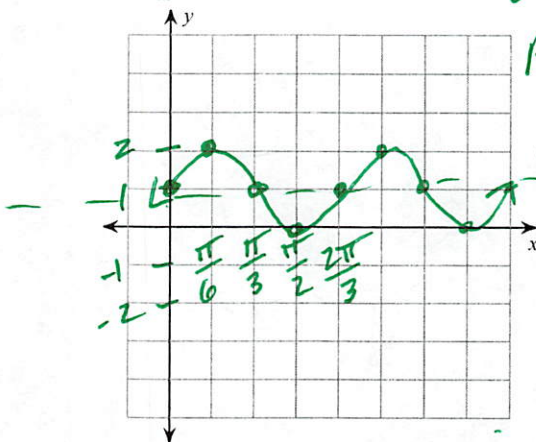
$a = 2$   
 $p = 2\pi$   
 p.s.  $\frac{\pi}{4}$  right  
 v.s. none

Critical points

$2\pi \cdot \frac{1}{4} = \frac{\pi}{2}$

$0 + \frac{\pi}{4} = \frac{\pi}{4}$     $\frac{\pi}{2} + \frac{\pi}{4} = \frac{3\pi}{4}$

7)  $y = \frac{1}{2} \cdot \sin 3\theta + 1$



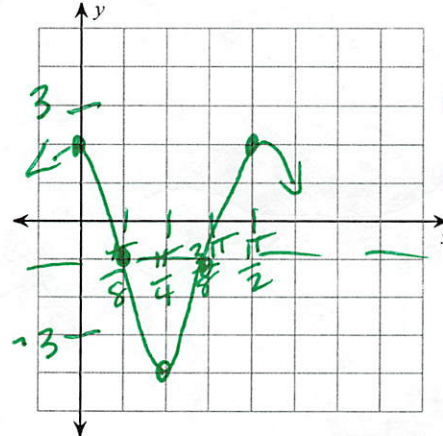
$a = \frac{1}{2}$   
 $p = \frac{2\pi}{3}$

p.s. none  
 v.s. up 1

Critical points

$\frac{2\pi}{3} \cdot \frac{1}{4} = \frac{\pi}{6}$

8)  $y = 3\cos 4\theta - 1$



$a = 3$   
 $p = \frac{2\pi}{4} = \frac{\pi}{2}$

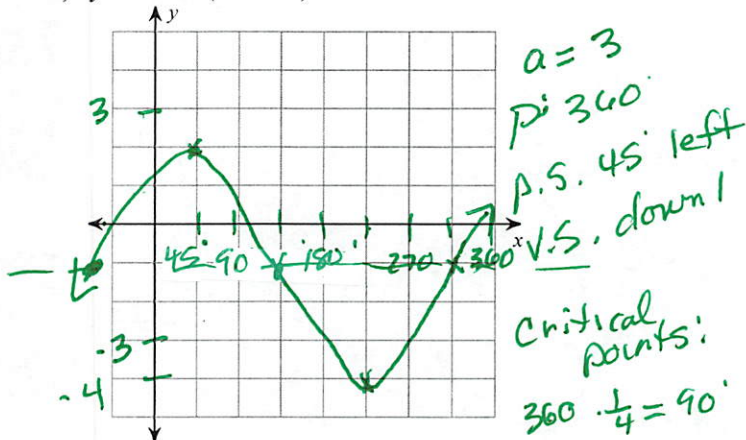
p.s. none  
 v.s. down 1

Critical points

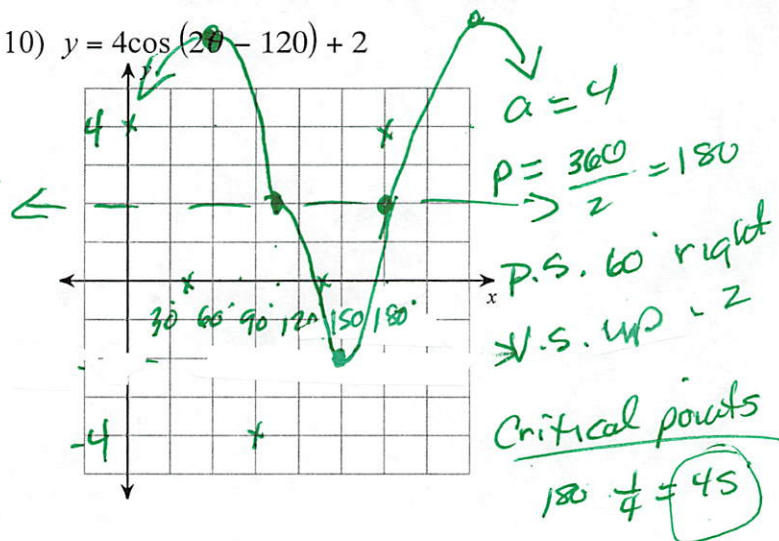
$\frac{\pi}{2} \cdot \frac{1}{4} = \frac{\pi}{8}$

Find the amplitude and period of each function. Then graph one full period using degrees:

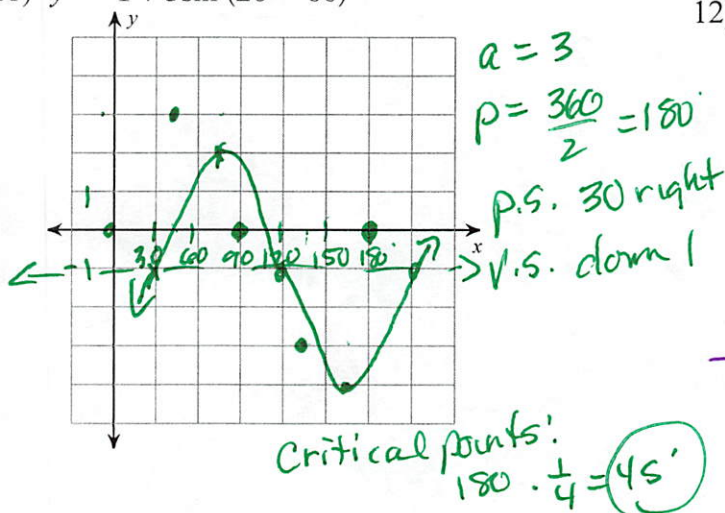
9)  $y = 3\cos(\theta + 45) - 1$



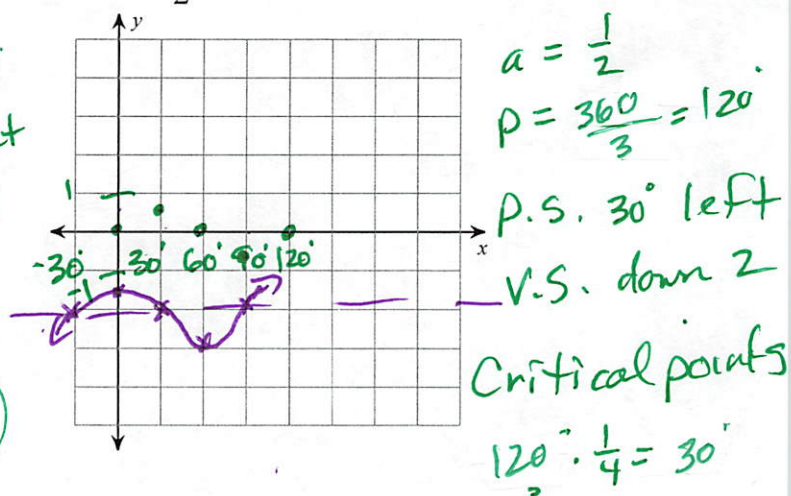
10)  $y = 4\cos(2\theta - 120) + 2$



11)  $y = -1 + 3\sin(2\theta - 60)$

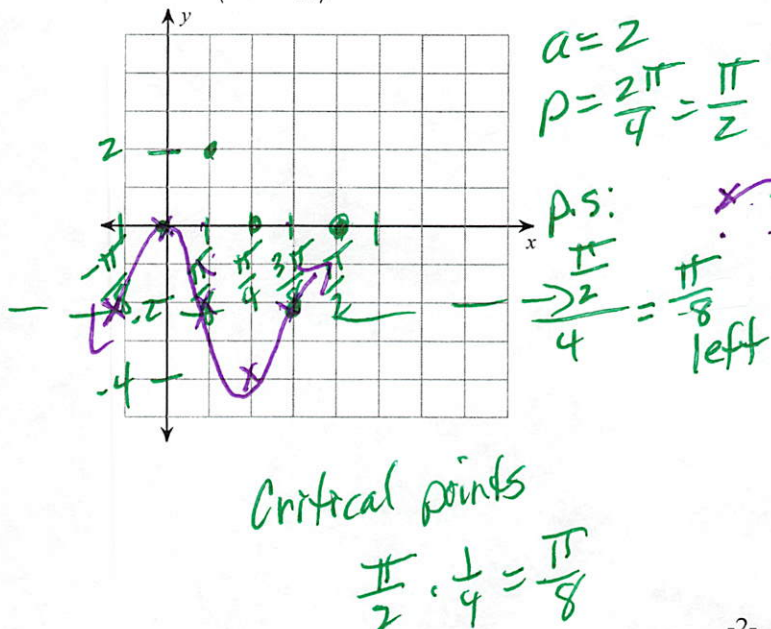


12)  $y = -2 + \frac{1}{2} \cdot \sin(3\theta + 90)$

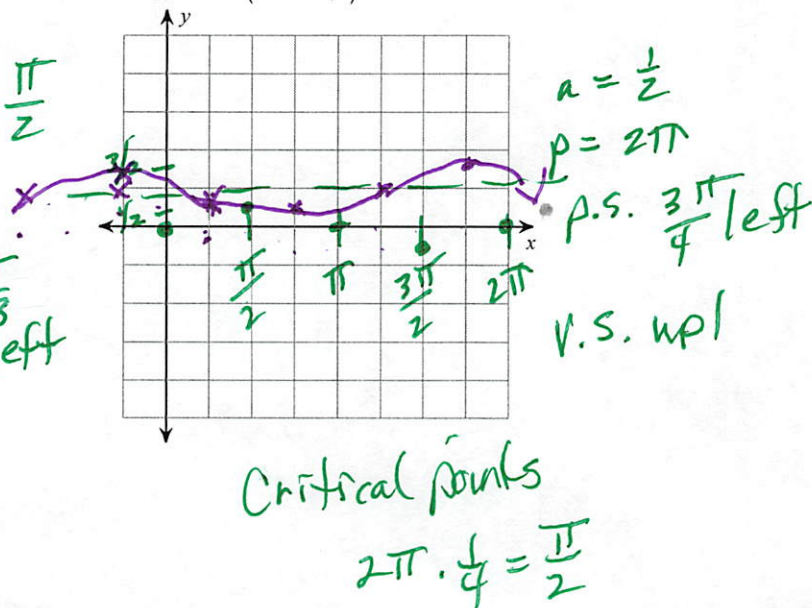


Find the amplitude and period of each function. Then graph one full period using radians:

13)  $y = 2\sin\left(4\theta + \frac{\pi}{2}\right) - 2$

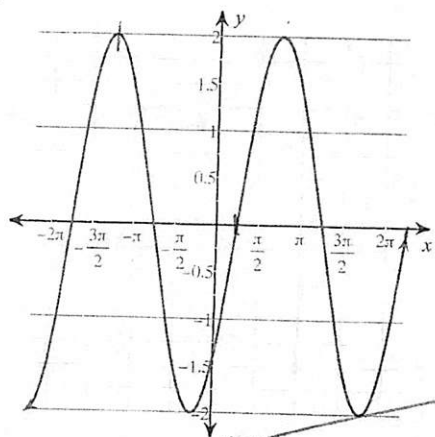


14)  $y = \frac{1}{2} \cdot \sin\left(\theta + \frac{3\pi}{4}\right) + 1$



State the amplitude and period then find the equation of the trigonometric function given.

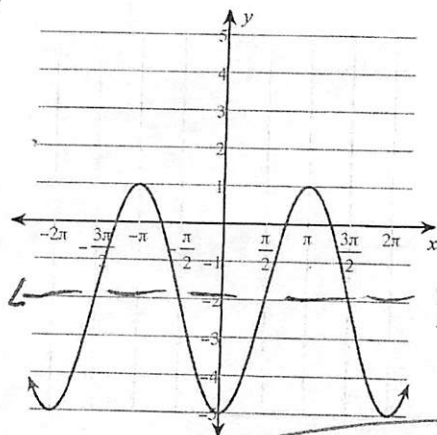
15)



$a: 2$   
 $P: 2\pi$   
 P.S.  $\frac{\pi}{4} \rightarrow$

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

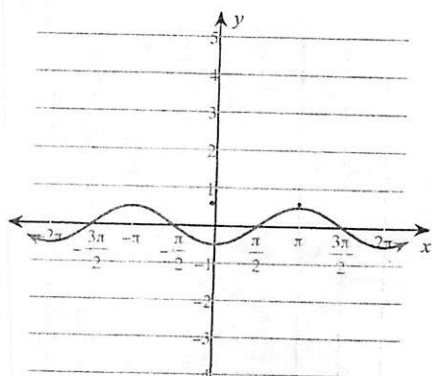
16)



$a: 3$   
 $P: 2\pi$   
 V.S. down 2

$$y = -3 \cos x - 2$$

17)

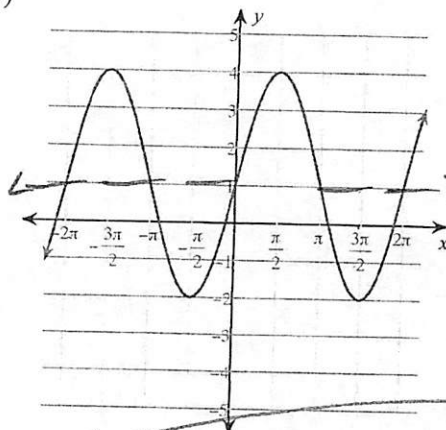


$a: \frac{1}{2}$   
 $P: 2\pi$   
 P.S.  $\pi$

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

or  $y = \frac{1}{2} \cos(x - \pi)$

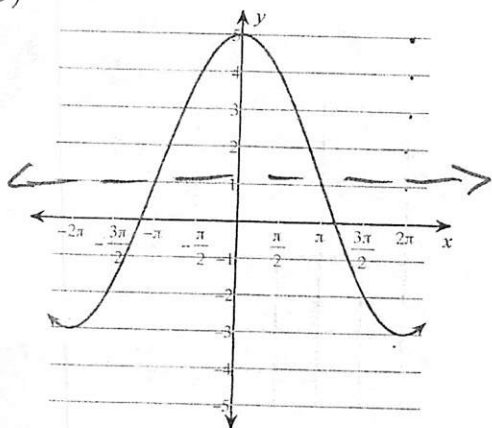
18)



$a: 3$   
 $P: 2\pi$   
 V.S. up 1

$$y = 3 \sin x + 1$$

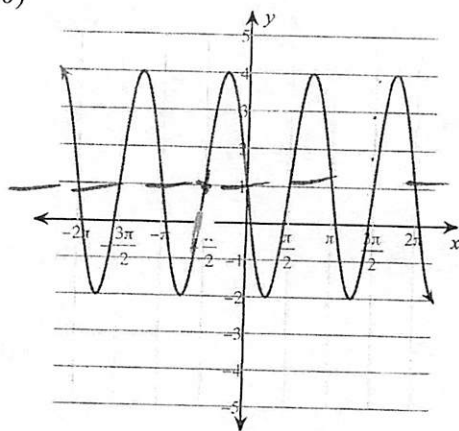
19)



$a: 4$   
 $P: 4\pi$   
 V.S.  $\uparrow 1$

$$y = 4 \cos \frac{1}{2}x + 1$$

20)



$a: 3$   
 $P: \pi$   
 V.S. up 1  
 P.S.  $\frac{\pi}{2}$   
 or  $\rightarrow$

$$y = 3 \sin(2x - \pi) + 1$$

or  $y = 3 \sin(2x + \pi) + 1$

21) Ecology: The population of an insect species in a stand of trees follows the growth cycle of a particular tree species. The insect population can be modeled by the function  $y = 40 + 5\sin\pi t$ , where  $t$  is the number of years since the stand was first cut.

a) What is the maximum insect population?

45

b) How often does the insect population reach its maximum (period)?

2 years

22) Along the coast, the tides are of particular interest. They are affected by the gravitational pull of both the moon and the sun. The high tides and low tides follow a periodic pattern that you can model with the sine function.

$$f(x) = 5\sin\frac{\pi}{4} \cdot t + 15 \text{ where } t \text{ is in hours.}$$

a) What is the time between each high tide (period)?

$$\frac{2\pi}{\pi/4} = 2\pi \cdot \frac{4}{\pi} = 8 \text{ hours}$$

b) What is the highest level of the tide (max)?

20

c) What is the lowest level of the tide (min)?

10

23) A bicycle wheel with radius 14 inches has the bottom-most point on the wheel marked in red. The wheel then begins rolling down the street. The periodic function represented by the bicycle

$$\text{wheel is } f(x) = -14\cos\frac{1}{14} \cdot x + 14$$

a) What is the diameter of the tire (Max height)?

28

b) How far does the wheel travel to complete one full rotation (period)?

$$\frac{2\pi}{1/14} = 28\pi$$