

Warm up

1. Find the following

a) $\sin\left(\frac{\pi}{4}\right)$ b.) $\cos\left(\frac{\pi}{2}\right)$ c) $\sin\left(\frac{3\pi}{4}\right)$ d) $\csc\left(\frac{5\pi}{4}\right)$

e) $\tan\left(\frac{3\pi}{2}\right)$ f) $\sec\left(\frac{7\pi}{6}\right)$ g) $\cos(2\pi)$

2. Find the following when $0 \leq \theta \leq 2\pi$

a. $\sin(\theta) = \frac{-\sqrt{3}}{2}$ b. $\tan(\theta) = 0$ c. $\sec(\theta) = -\sqrt{2}$

In Exercises 19–24, evaluate *without* using a calculator.

19. $\sin\left(\frac{\pi}{3}\right) \frac{\sqrt{3}}{2}$

20. $\tan\left(\frac{\pi}{4}\right) 1$

21. $\cot\left(\frac{\pi}{6}\right) \sqrt{3}$

22. $\sec\left(\frac{\pi}{3}\right) 2$

23. $\cos\left(\frac{\pi}{4}\right) \frac{\sqrt{2}}{2}$

24. $\csc\left(\frac{\pi}{3}\right) 2/\sqrt{3}$

80 90 95

In Exercises 41–48, find the acute angle θ that satisfies the given equation. Give θ in both degrees and radians. You should do these problems without a calculator.

41. $\sin \theta = \frac{1}{2} \quad 30^\circ = \frac{\pi}{6}$

42. $\sin \theta = \frac{\sqrt{3}}{2} \quad 60^\circ = \frac{\pi}{3}$

43. $\cot \theta = \frac{1}{\sqrt{3}} \quad 60^\circ = \frac{\pi}{3}$

44. $\cos \theta = \frac{\sqrt{2}}{2} \quad 45^\circ = \frac{\pi}{4}$

45. $\sec \theta = 2 \quad 60^\circ = \frac{\pi}{3}$

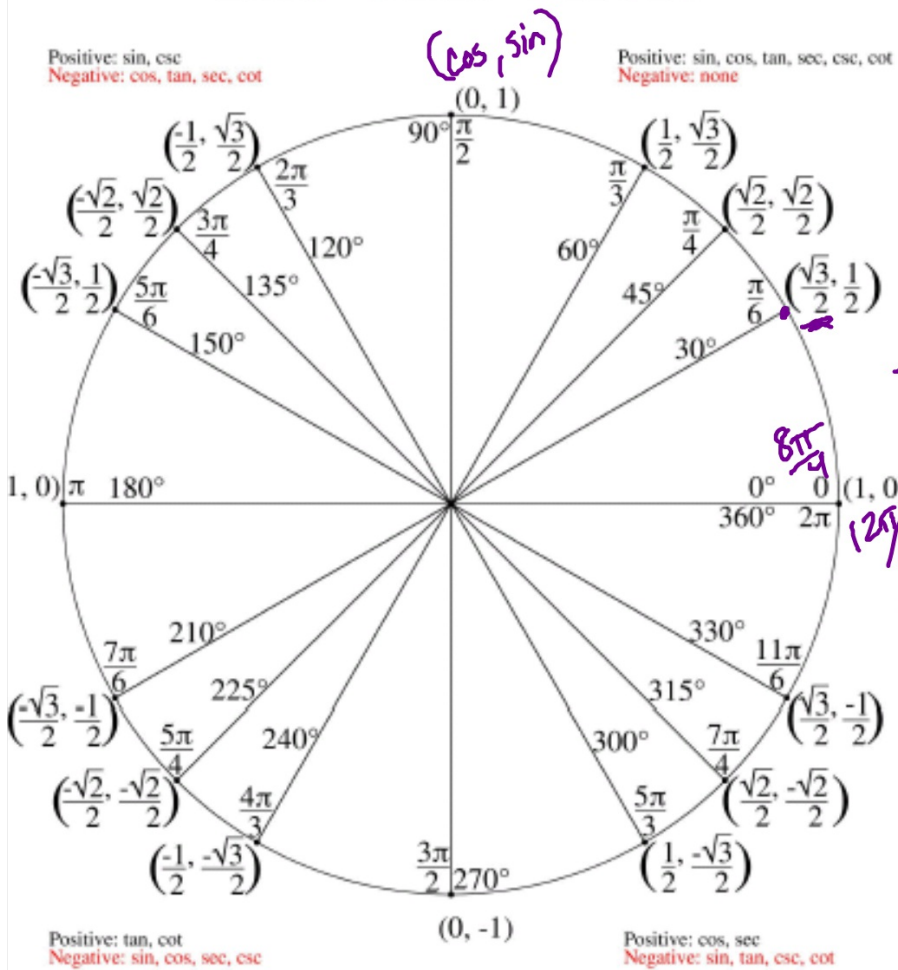
46. $\cot \theta = 1 \quad 45^\circ = \frac{\pi}{4}$

47. $\tan \theta = \frac{\sqrt{3}}{3} \quad 30^\circ = \frac{\pi}{6}$

48. $\cos \theta = \frac{\sqrt{3}}{2} \quad 30^\circ = \frac{\pi}{6}$

**Find negative values and values off
the unit circle.**

The Unit Circle



Off the Circle

Examples:

1) $\cos 13\pi/6$

2) $\sin 21\pi/4$

3) $\cos 5\pi/2$

4) $\sin 13\pi/3$

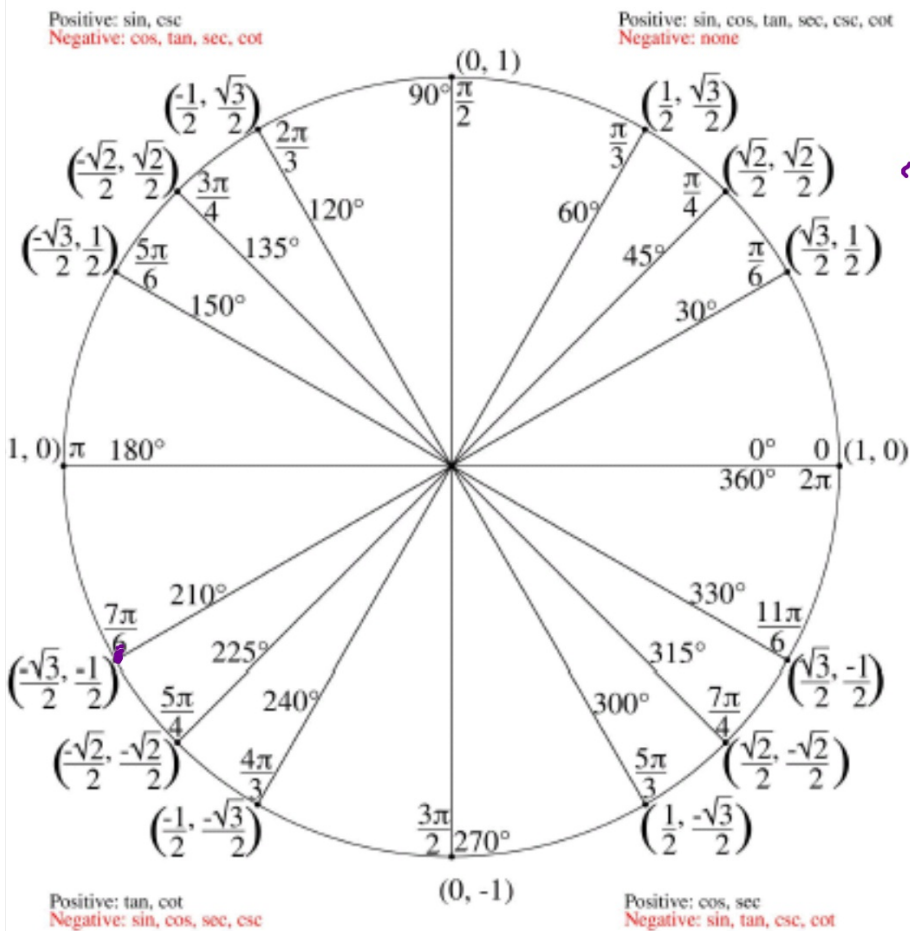
5) $\cos 420^\circ$

$13\pi/6 - 12\pi/6 = \pi/6$
 $\sqrt{3}/2$
 $21\pi/4 - 8\pi = 5\pi/4$
 $-\sqrt{2}/2$
 $5\pi/2 - 4\pi = \pi/2$
 0
 $13\pi/3 - 12\pi/3 = \pi/3$
 $1/2$
 $420^\circ - 360^\circ = 60^\circ$
 $1/2$

The Unit Circle

Negatives

Examples:



$-\frac{\sqrt{3}}{2}$
1) $\cos -5\pi/6 = \frac{\sqrt{3}}{2}$

2) $\sin -7\pi/4 = \frac{\sqrt{2}}{2}$

3) $\cos -15\pi/4 = \frac{\sqrt{2}}{2}$

4) $\sin -3\pi/2 = 1$

$$11) \sin -135^\circ = -\frac{\sqrt{2}}{2}$$

$$13) \cos -150^\circ = -\frac{\sqrt{3}}{2}$$

$$15) \sin -330^\circ = \frac{1}{2}$$

$$17) \cos -\frac{11\pi}{6} = \frac{\sqrt{3}}{2}$$

$$19) \cos 300^\circ = \frac{1}{2}$$

$$21) \cot -\frac{11\pi}{6} = \sqrt{3}$$

$$23) \cot -\pi$$

Undefined

$$25) \cos \frac{\pi}{3} = \frac{1}{2}$$

$$27) \cot -\frac{\pi}{6} = -\sqrt{3}$$

$$12) \cos 150^\circ = -\frac{\sqrt{3}}{2}$$

$$14) \sin -\frac{2\pi}{3} = -\frac{\sqrt{3}}{2}$$

$$16) \cos -315^\circ = \frac{\sqrt{2}}{2}$$

$$18) \cos -120^\circ = -\frac{1}{2}$$

$$20) \sin -300^\circ = \frac{\sqrt{3}}{2}$$

$$22) \csc \frac{4\pi}{3} = -\frac{2\sqrt{3}}{3}$$

$$24) \sec -\frac{\pi}{4} = \sqrt{2}$$

$$26) \tan 0$$

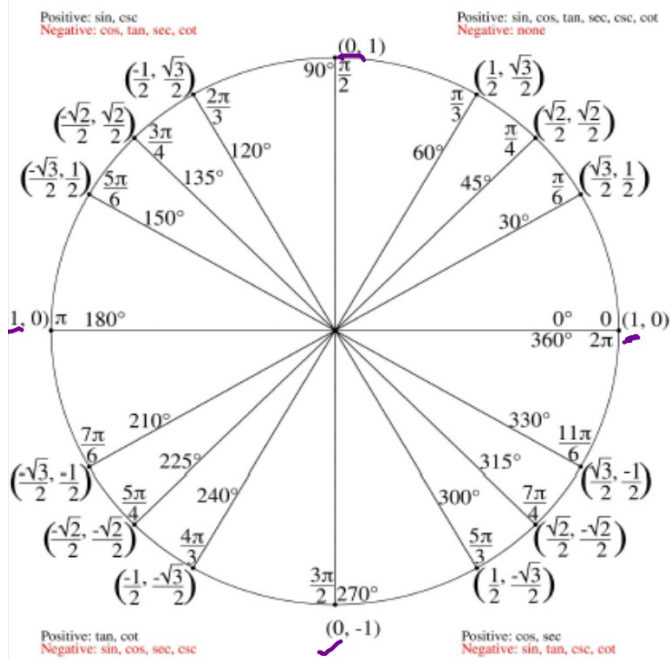
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$$28) \sin \pi$$

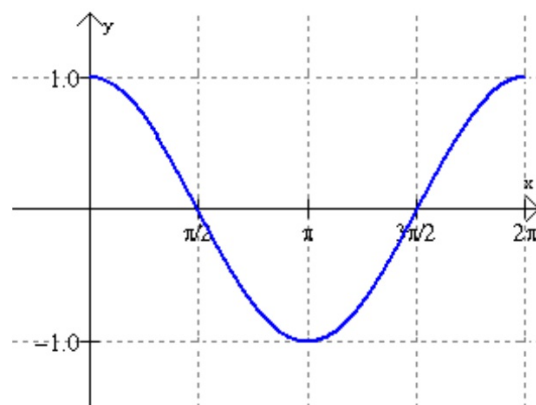
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Objective: To graph Sine and Cosine Functions and their reciprocal functions

The Unit Circle



Cos function



WHAT YOU GOTTA KNOW

Sine and Cosine are known as Periodic Functions .

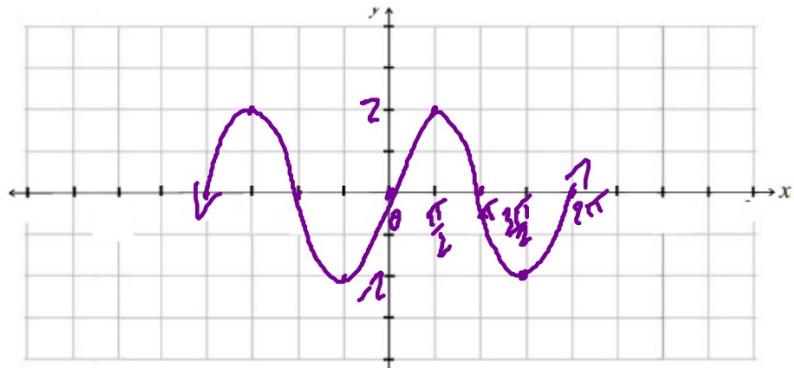
A period is one full cycle .

The basic sine or cosine function has a period of 2π .

Half the distance between the max and min of a graph is known as the amplitude .

$$2 \sin \theta$$

For example:



Transformation of the Sin and cosine Functions

$$y = a \text{ "trig" } (b\theta + c) + d$$

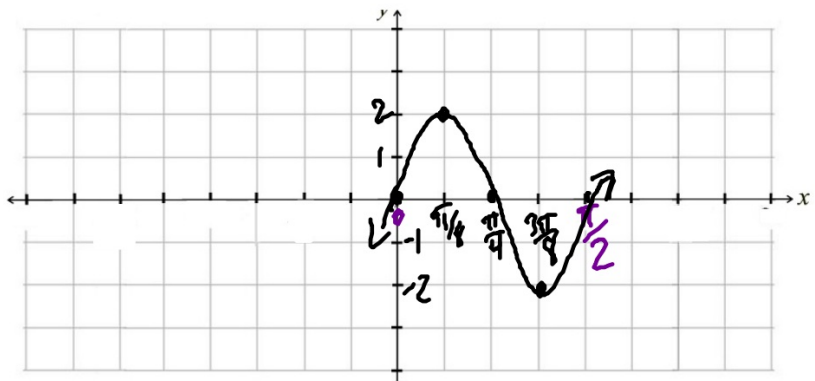
The four parts:

meanings:

- the amplitude is $|a|$ -how far from the center to the max or min
- the period is $2\pi/b$ -the measure of one cycle
- the phase shift is $-c/b$ -the translation to the left or right
- the vertical shift is d . -the translation up or down

$$y = 2 \sin(4\theta)$$

amplitude 2
 period: $\frac{2\pi}{4} = \frac{\pi}{2}$
 phase shift: -
 reflection: -
 vertical shift: -



	X	Y	
0	0	0	0
$\frac{\pi}{8}$	$\frac{\pi}{8}$	1	2
$\frac{\pi}{4}$	$\frac{\pi}{4}$	0	0
$\frac{3\pi}{8}$	$\frac{3\pi}{8}$	-1	-2
$\frac{\pi}{2}$	$\frac{\pi}{2}$	0	0

$$y = 2 \cos(\theta + \pi)$$

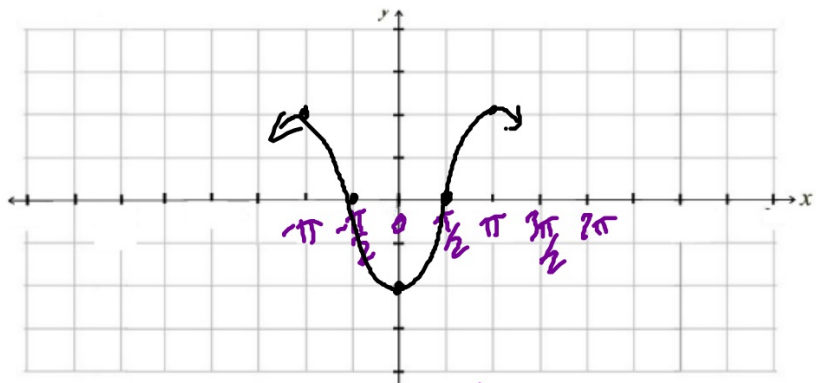
amplitude 2

period: 2π

phase shift: $-\pi$

reflection: -

vertical shift: -



x	y
0	-2
$\frac{\pi}{2}$	0
π	2
$\frac{3\pi}{2}$	0
2π	-2

$$y = \cos(2\pi\theta - \pi/2) + 1$$

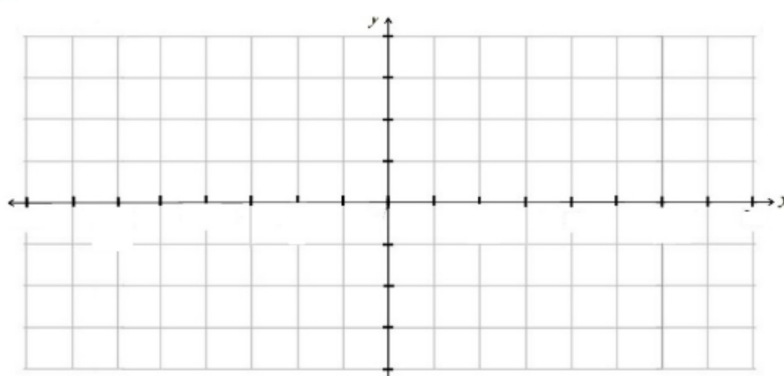
amplitude _____

period: _____

phase shift: _____

reflection: _____

vertical shift: _____



. $y = -4 \sin(\pi\theta) - 1$

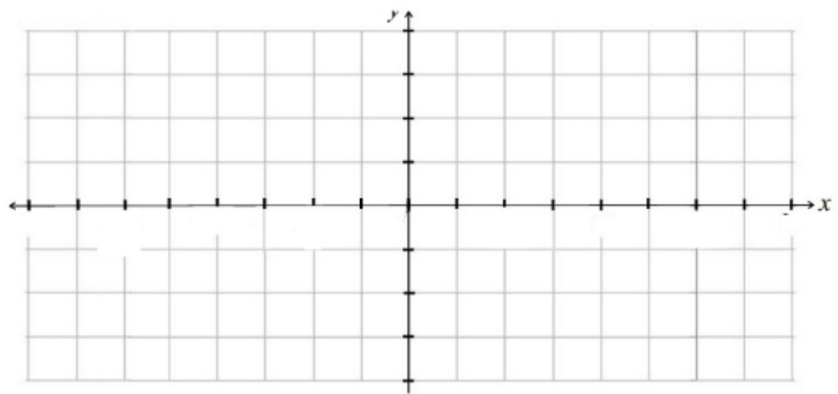
amplitude _____

period: _____

phase shift: _____

reflection: _____

vertical shift: _____



Practice:

1) $y = 2 + 3\cos(\pi\theta)$

2) $y = -3\sin(2\theta - \pi/2)$

3) $y = -4\cos(\theta + 2) - 1$

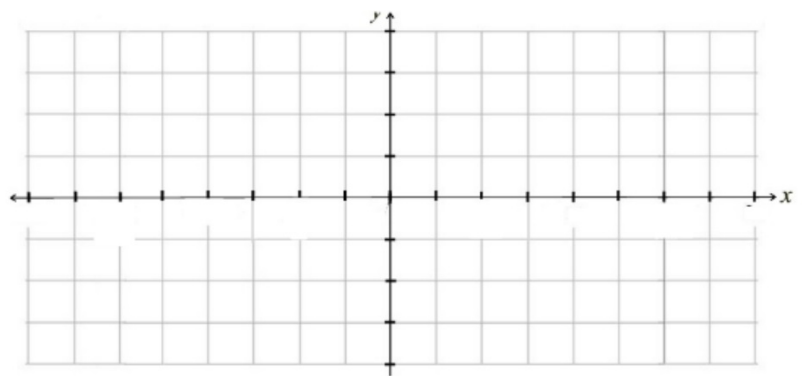
4) $y = \sin(4\pi\theta - \pi)$

Graphs of secant and cosecant functions

- 1. Graph its reciprocal**
- 2. Place an asymptote where it equals 0 before vertical transformations**
- 3. Flip the curves**
- 4. Write the equations for the asymptotes in terms of n**

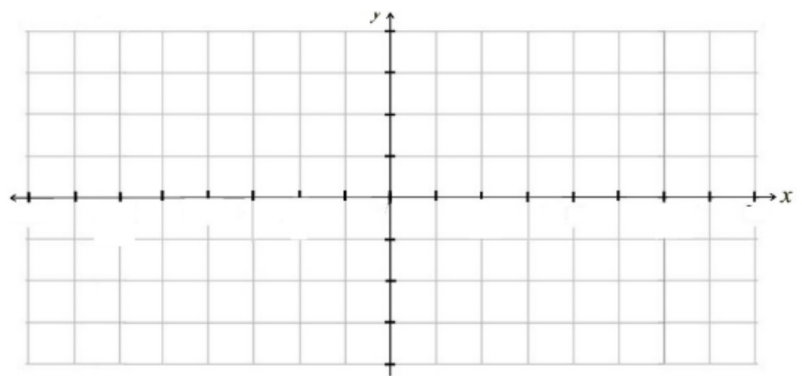
7. Graph

$$f(x) = \csc(x)$$



8. Graph

$$f(x) = \sec(x)$$



9. $y = -2 \csc 4x$

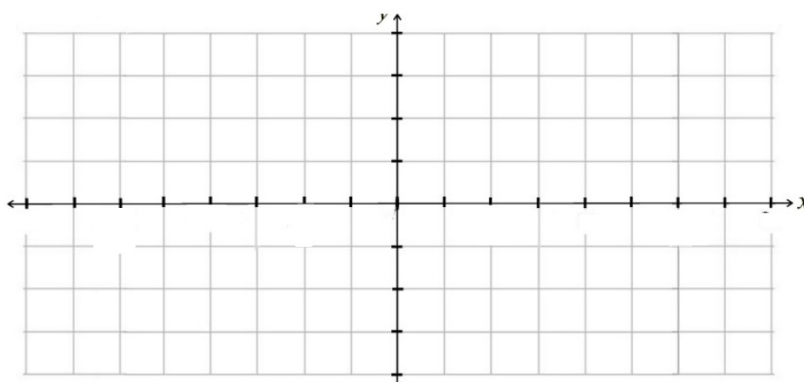
amplitude _____

period: _____

phase shift: _____

reflection: _____

vertical shift: _____



10. $y = 4 \csc \pi x - 1$

amplitude _____

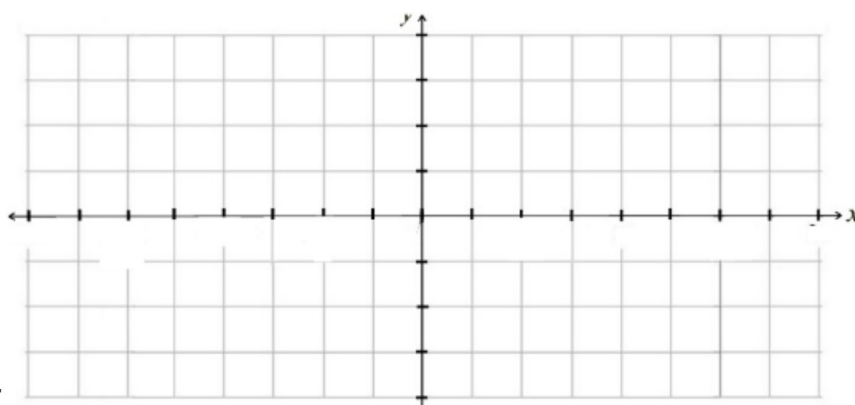
period: _____

phase shift: _____

reflection: _____

vertical shift: _____

Asymptotes: _____



11. $y = \sec(2\pi x - \pi/2) + 1$

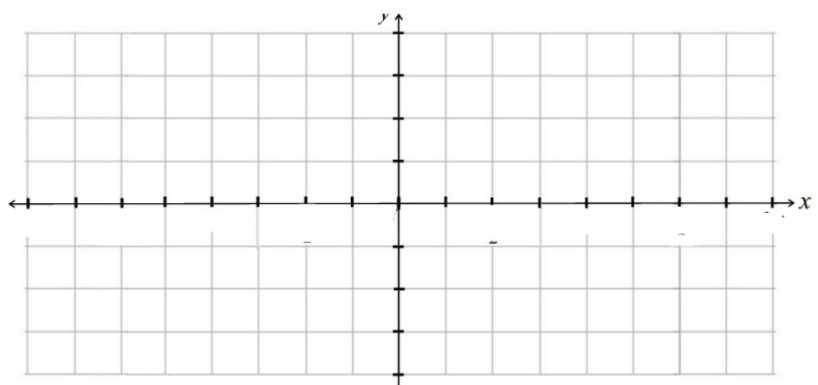
amplitude _____

period: _____

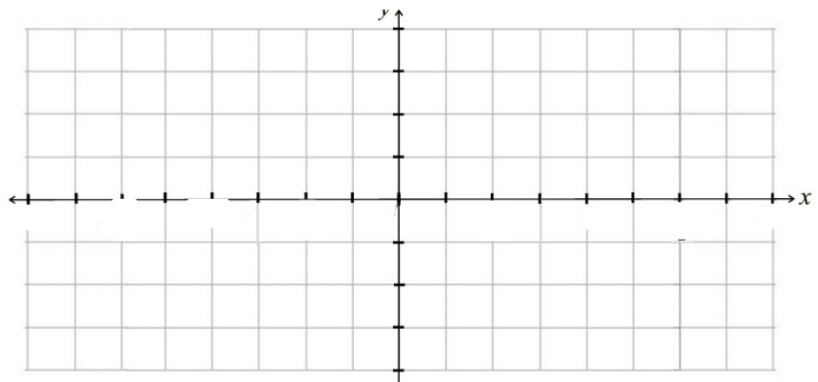
phase shift: _____

reflection: _____

vertical shift: _____



12. $y = 2 \sec(\theta + \pi)$



amplitude _____

period: _____

phase shift: _____

reflection: _____

vertical shift: _____

Asymptotes: _____