

IDENTIFYING AMPLITUDE AND VERTICAL SHIFTS

Section 4.6A

Precalculus PreAP/Dual, Revised ©2017

viet.dang@humbleisd.net

TRANSFORMATIONS

A. Equation: $y = A$ trig function $B(x - C) + D$

***B.* A is the amplitude**

1. a : vertically stretches by a factor of a ,
2. $\frac{1}{a}$: Vertically compresses by a factor of $1/a$

***C.* B is the period or frequency**

1. *Period equation:* $\frac{2\pi}{B}$ for sine and cosine, $\frac{\pi}{B}$ for tangent
2. B : horizontally compresses by a factor of $\frac{\pi}{B}$
3. $\frac{1}{B}$: horizontally stretches by a factor of b
4. $-b$: Reflects over the y -axis

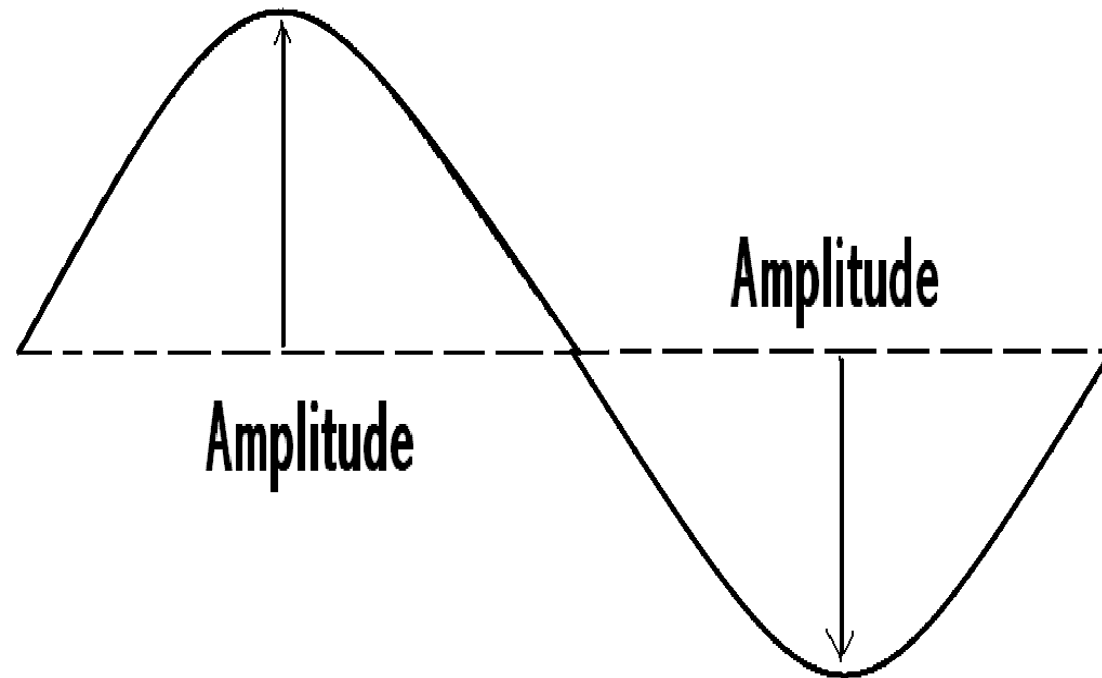
***D.* C is the phase shift**

- 1.If there no GCF taken out, divide the coefficient

***E.* D is the vertical shift**

AMPLITUDE

Amplitude (a) the maximum or minimum vertical distance between the graph and the x -axis. Amplitude is always positive.

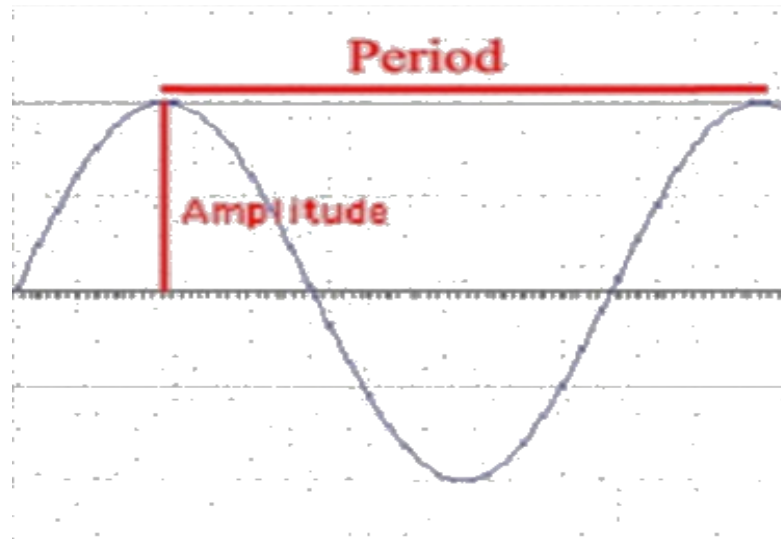


PERIOD

The period of a function is the x -interval needed for the function to complete one cycle.

For $b > 0$, the period of $y = a \sin bx$ or $y = a \cos bx$ is $\frac{2\pi}{b}$.

If $0 < b < 1$, the graph of the function is stretched horizontally.



EXAMPLE 1

Describe the transformation(s) of $y = 4 \csc x + 1$

Vertical Stretch by 4
Up 1

EXAMPLE 2

Describe the transformation(s) of $y = -\frac{1}{2} \sin 4x - 2$

Reflect over the x -axis

Horizontally Compressed by $\frac{1}{4}$

Vertically Compressed by $\frac{1}{2}$

Down 2

YOUR TURN

Describe the transformation(s) of $y = 5 \cos x + 3$

Vertically Stretched by 5
Up 3

EXAMPLE 3

Given $y = 4 \sin\left(\frac{1}{2}x + 1\right) + 3$, identify amplitude, period, vertical shift, and phase shift for one period.

$$y = A \operatorname{trig} B(x - C) + D$$

$$\text{Period} : \frac{2\pi}{B} = \frac{2\pi}{\frac{1}{2}} = 4\pi$$

$$\begin{aligned} \text{Phase Shift} : \frac{1}{2}x + 1 &= 0 \\ \frac{1}{2}x &= -1 & x &= -2 \end{aligned}$$

Amplitude	4
Period	4π
Vertical Shift	<i>Up 3</i>
Phase Shift	<i>Left 2</i>

EXAMPLE 4

Given $y = -2 \cos(3x - 4) - 1$ identify amplitude, period, vertical shift, and phase shift for one period.

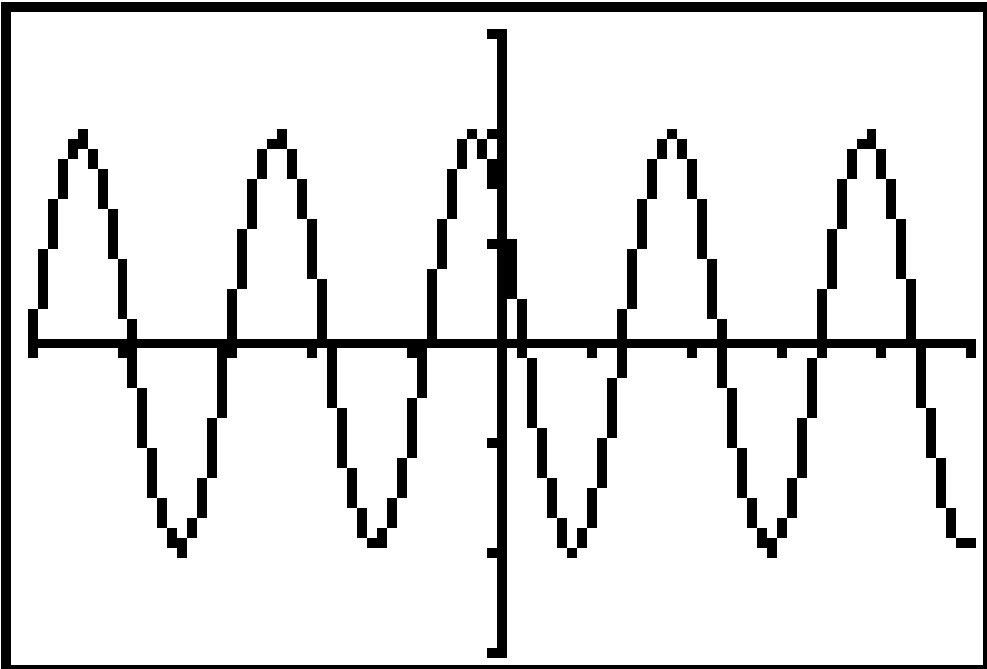
$$y = A \operatorname{trig} B(x - C) + D$$

Phase Shift :

$$\text{Period} : \frac{2\pi}{B} = \frac{2\pi}{3}$$

$$3x - 4 = 0$$

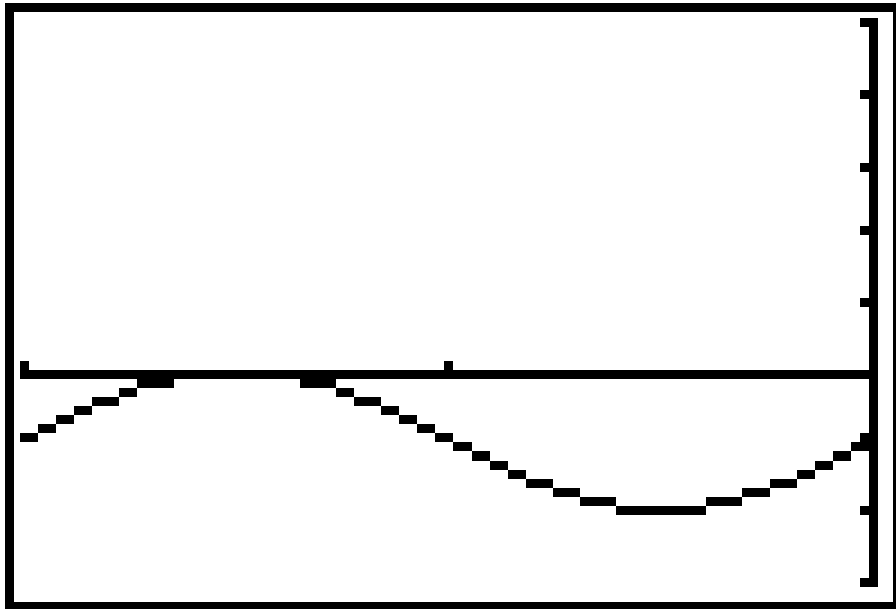
$$x = \frac{4}{3}$$



Amplitude	2
Period	$\frac{2\pi}{3}$
Vertical Shift	<i>Right</i> $\frac{4}{3}$
Phase Shift	<i>Down</i> 1

YOUR TURN

Given $y = \sin 2(x + \pi) - 1$ identify amplitude, period, vertical shift, and phase shift for one period.



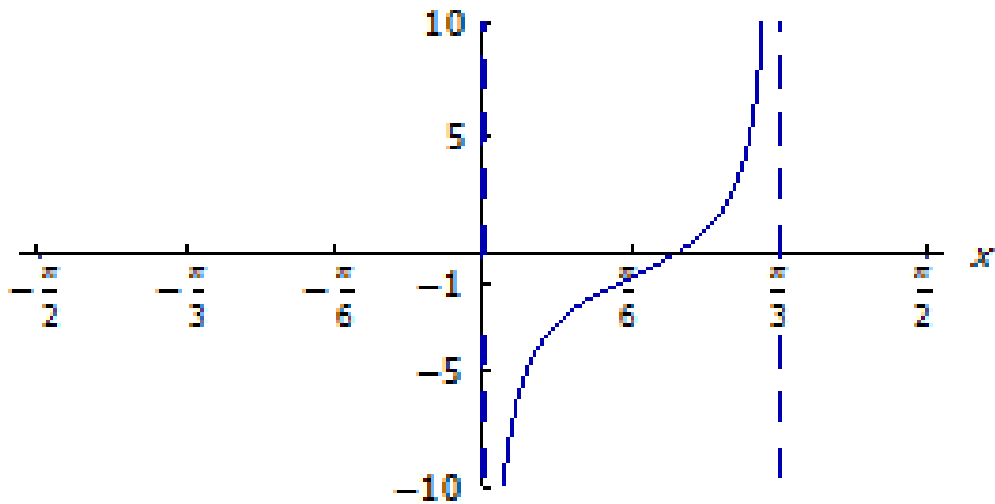
$$y = A \operatorname{trig} B(x - C) + D$$

$$\text{Period} : \frac{2\pi}{B} = \frac{2\pi}{2} = \pi$$

Amplitude	1
Period	π
Vertical Shift	Down 1
Phase Shift	Left π

EXAMPLE 5

Given $y = 2 \tan\left(3x - \frac{\pi}{2}\right) - 1$ identify amplitude, period, vertical shift, and phase shift for one period.



Amplitude	None
Period	$\frac{\pi}{3}$
Vertical Shift	Down 1
Phase Shift	<i>Right</i> $\frac{\pi}{6}$

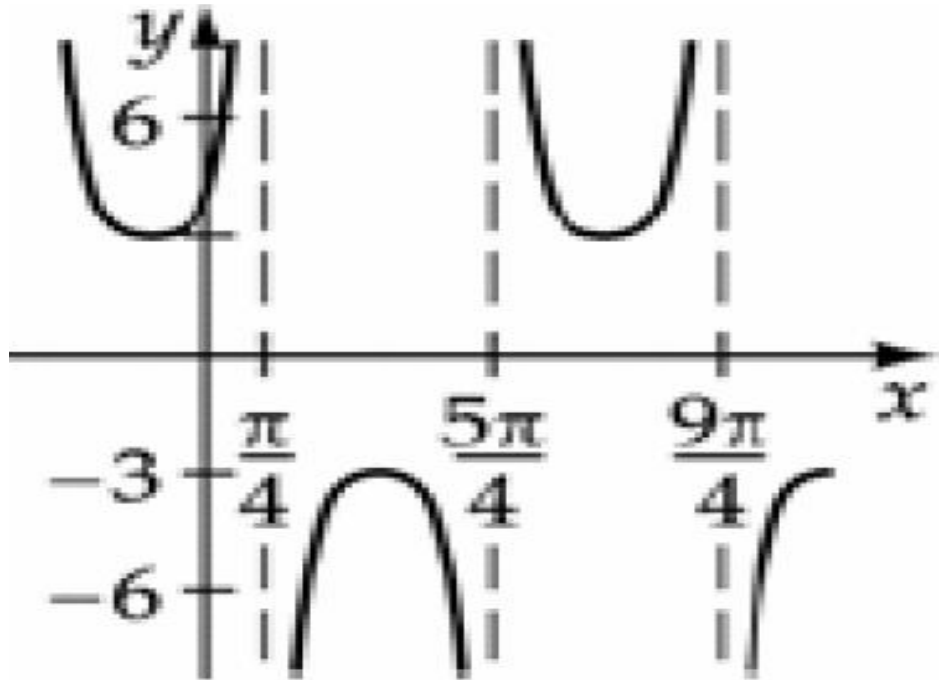
EXAMPLE 6

Given $y = 5 \sec\left(3x + \frac{\pi}{7}\right)$ identify amplitude, period, vertical shift, and phase shift for one period.

Amplitude	<i>None</i>
Period	$\frac{2\pi}{3}$
Vertical Shift	<i>None</i>
Phase Shift	<i>Left</i> $\frac{\pi}{21}$

YOUR TURN

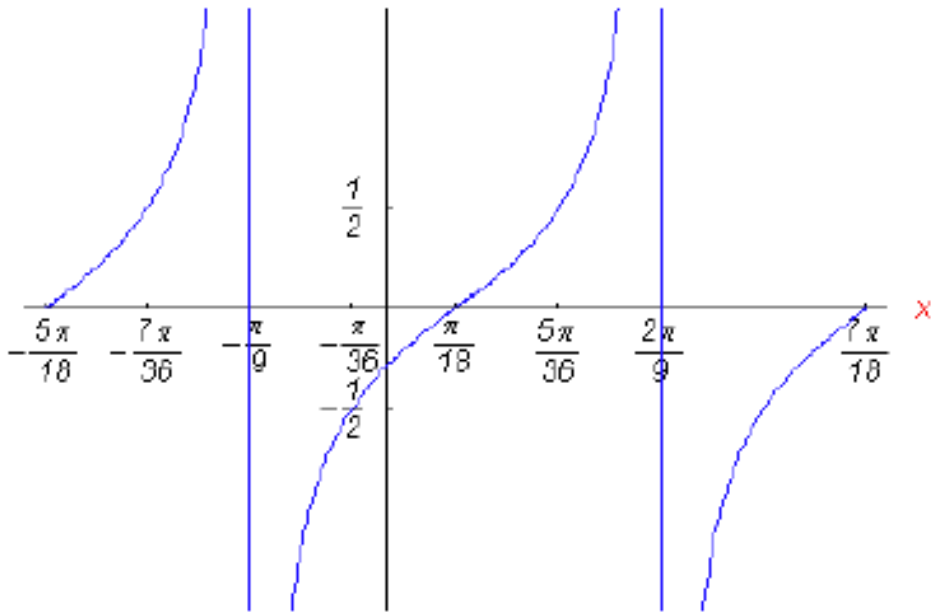
Given $y = 3 \sec\left(x + \frac{\pi}{4}\right)$ identify amplitude, period, vertical shift, and phase shift for one period.



Amplitude	<i>None</i>
Period	2π
Vertical Shift	<i>None</i>
Phase Shift	<i>Left</i> $\frac{\pi}{4}$

EXAMPLE 7

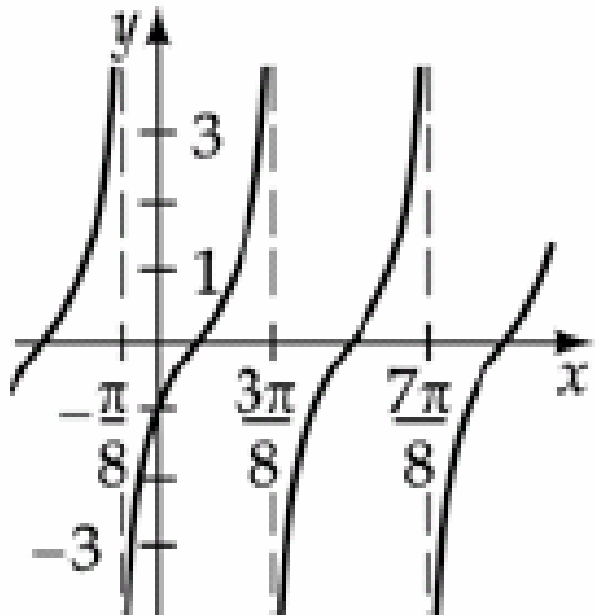
Given $y = -\frac{1}{2} \tan\left(-3x + \frac{\pi}{6}\right)$ identify amplitude, period, vertical shift, and phase shift for one period.



Amplitude	<i>None</i>
Period	$\frac{\pi}{3}$
Vertical Shift	<i>None</i>
Phase Shift	<i>Right</i> $\frac{\pi}{18}$

YOUR TURN

Given $y = -\cot\left(2x + \frac{\pi}{4}\right)$ identify amplitude, period, vertical shift, and phase shift for one period.



Amplitude	<i>None</i>
Period	$\frac{\pi}{2}$
Vertical Shift	<i>None</i>
Phase Shift	<i>Left</i> $\frac{\pi}{8}$

ASSIGNMENT

Worksheet 3