

Trig 6.5

Find the phase shift and vertical translation for sine and cosine
 Write equations given amplitude, period, phase shift and vertical translation

Graph compound functions

$$\frac{2\pi}{2} =$$

$$y = C + A \sin\left(\frac{2\pi}{P}(x - \phi)\right)$$

amplitude

period 2π

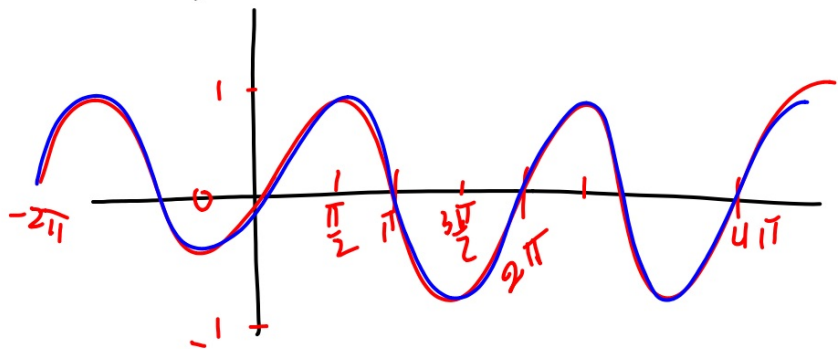
midline (centerline)
 $y = 0$

vertical translation

phase shift

compound function

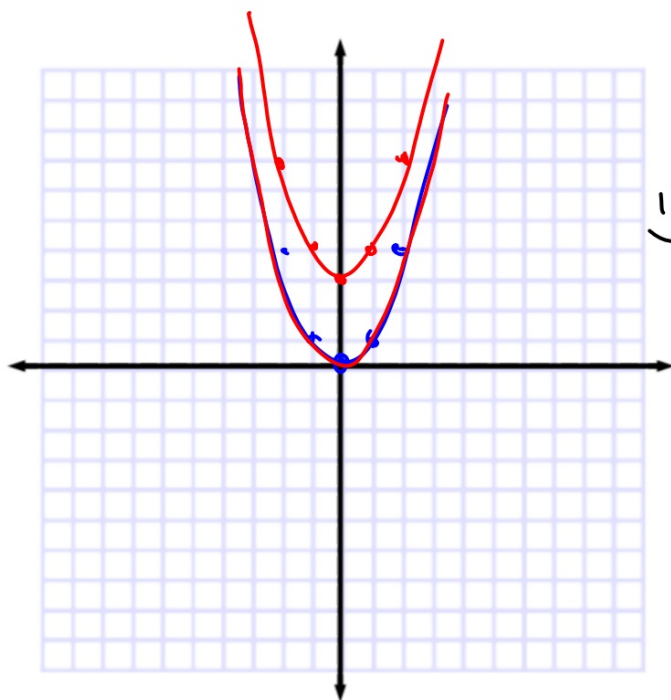
activity: Desmos



$$y = x^2 \downarrow 3$$

$$y = 3 + x^2$$

Transformations of parent graph (Algebra 2)



$$y = \sin x$$

$$y = \sin x + 2$$

☺

$$y = 2 + \sin x$$

Desmos

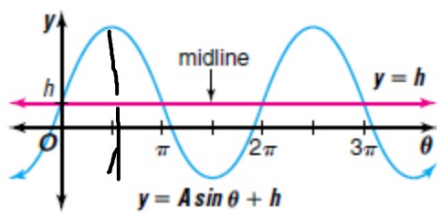
$$y = \sin x$$

$$y = 2 + \sin x$$

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

....etc.

Note: Is $2 + (\text{whatever}) = (\text{whatever}) + 2$?



Midline (centerline) is an equation!
 $y =$

**Vertical Shift
of Sine and
Cosine
Functions**

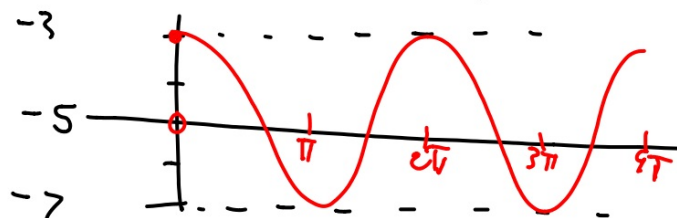
The vertical shift of the functions $y = A \sin(k\theta + c) + h$ and $y = A \cos(k\theta + c) + h$ is h . If $h > 0$, the shift is upward. If $h < 0$, the shift is downward. The midline is $y = h$.

$$VS = 5 \text{ down}$$

$$y = -5$$

Example 2 State the vertical shift and the equation of the midline for the function $y = 2 \cos \theta - 5$. Then graph the function.

$$y = -5 + 2\cos\theta$$



Graphing Sine
and Cosine
Functions

1. Determine the vertical shift and graph the midline.
2. Determine the amplitude. Use dashed lines to indicate the maximum and minimum values of the function.
4. Determine the period of the function and graph the appropriate sine or cosine curve.
3. Determine the phase shift and translate the graph accordingly.

$$\left(x - \frac{\pi}{6}\right)$$

$$\left(\theta + \frac{\pi}{3}\right)$$

$$(x-2)^2$$

If it was just 2θ what would change?

Factor so just θ to see the phase angle (horizontal shift)

$$y = 0$$

$$Amp = 1$$

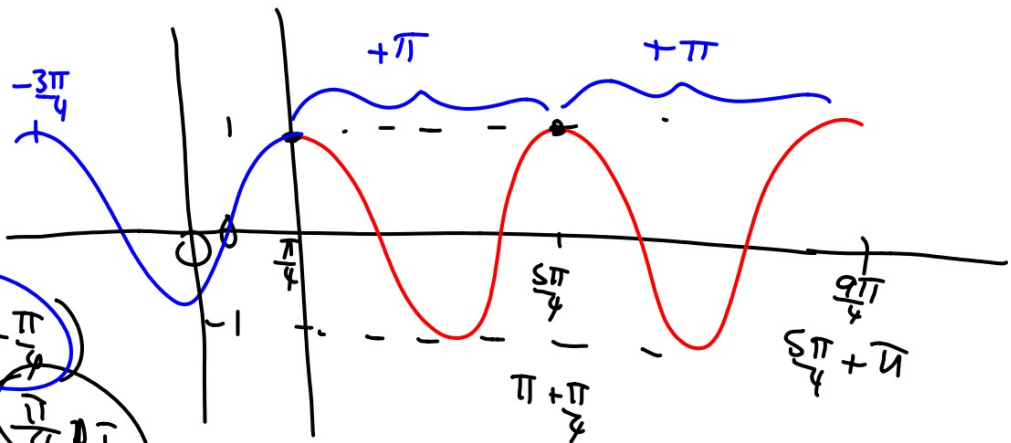
factor

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

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

$$\frac{2\pi}{2} = \pi$$

$$\frac{\pi}{2} \text{ or } \pi$$



Example 3 State the amplitude, period, phase shift, and vertical shift for

$y = 4 \cos\left(\frac{\theta}{2} + \pi\right) - 6$. Then graph the function.

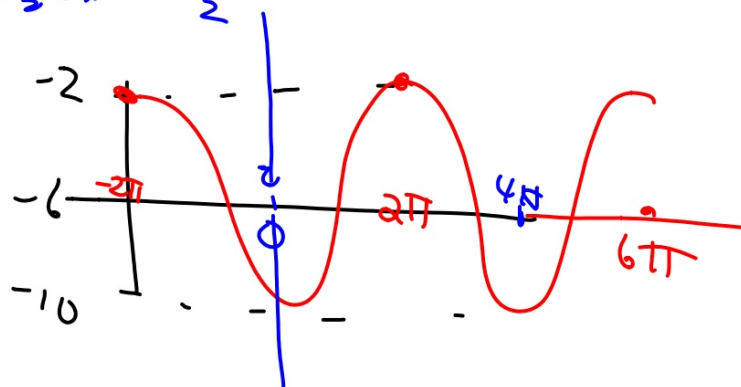
$$A = 4 \quad \frac{1}{2}(\theta + 2\pi) \quad \frac{2\pi}{\frac{1}{2}}$$

$$\text{per} = 4\pi \quad \frac{1}{2}\theta + \frac{1}{2} \cdot 2\pi \quad \frac{1}{2}$$

$$\text{PS} = 2\pi \text{ left}$$

$$\text{vert down } 6$$

$$y = -6$$



$$\frac{2\pi}{h} = \pi$$

Example 5 Write an equation of a sine function with amplitude 4, period $\frac{3\pi}{2}$, phase shift $-\frac{\pi}{8}$, and vertical shift 6.

$$y = 6 + 4 \sin\left(\frac{2}{3}(\theta + \frac{\pi}{8})\right)$$

$$\frac{2\pi}{h} = \frac{\pi}{1}$$

$$h \cdot \frac{\pi}{\pi} = \frac{2\pi}{\pi}$$

$$\left(2\theta + \frac{\pi}{4}\right)$$

$$\frac{2\pi}{h} = \frac{3\pi}{1}$$

$$\frac{3\pi h}{3\pi} = \frac{2\pi}{3\pi}$$

