6.5: Translations of Sine and Cosine Functions

Phase Shift of Sine and Cosine Functions

$$y = A\sin(k_n - c) \quad \text{and} \quad y = A\cos(k_n - c)$$

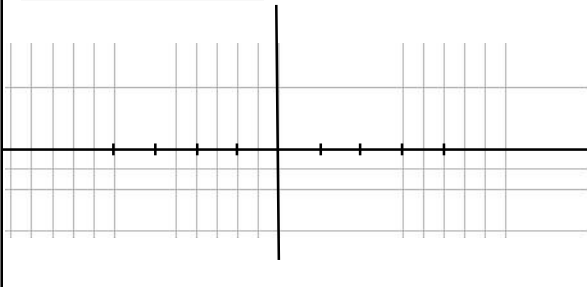The phase shift of the sine and cosine functions where $k > 0$ is

$$\frac{c}{k}$$

• If $c > 0$, the shift is to the right.
• If $c < 0$, the shift is to the left.

Phase Shift of Sine and Cosine Functions

1 State the phase shift for each function. Then graph the function.

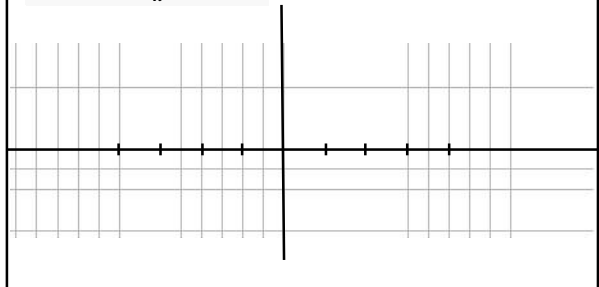a. $y = \sin(\theta + \pi)$

Phase Shift : $\dfrac{c}{k}$ N

Phase Shift of Sine and Cosine Functions

1 State the phase shift for each function. Then graph the function.

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

Phase Shift : $\dfrac{c}{k}$ N

Amplitude, Period and Phase Shift

Find the value of k, c, amplitude, period, and phase shift of the sinusoidal function.

$$y = 5\sin\left(2x - \frac{f}{4}\right)$$

Amplitude : $|A|$ N

Period : T N $\dfrac{2f}{k}$ N

Phase Shift : $\dfrac{c}{k}$ N

Vertical Shift of Sine and Cosine Functions

$$y = A\sin(k_n - c) + h \quad \text{and} \quad y = A\cos(k_n - c) + h$$

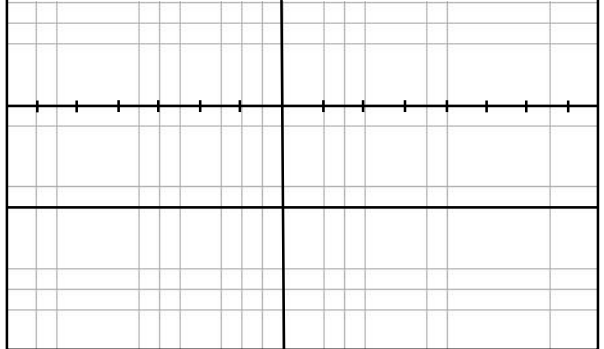The vertical shift of the sine and cosine functions is $\underline{h}$. The midline is $y = h$.

• If $h > 0$, the shift is upward.
• If $h < 0$, the shift is downward.

Graphing of 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.
3. Determine the period of the function and graph the appropriate sine or cosine curve.
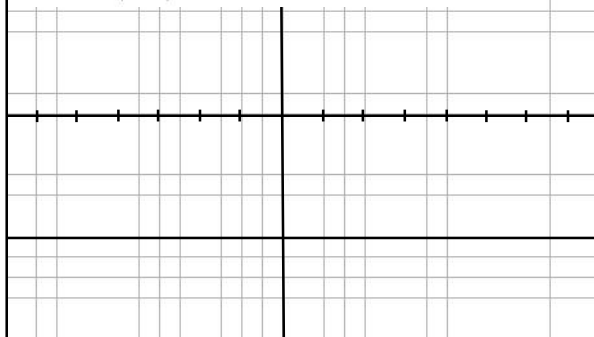4. Determine the phase shift and translate the graph accordingly.

Vertical Shift of Sine and Cosine Functions

❷ State the vertical shift and the equation of the midline for the function $y = 2\cos\theta - 5$. Then graph the function.
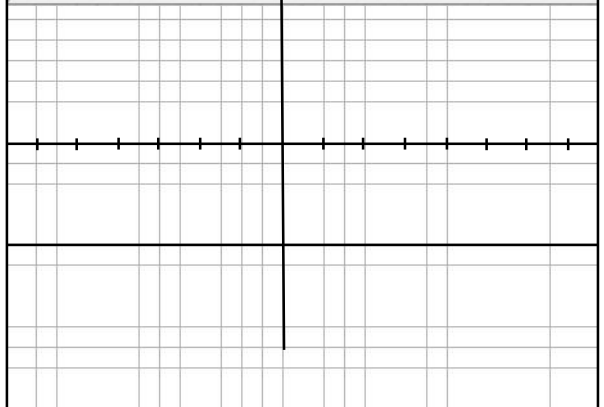
Vertical Shift of Sine and Cosine Functions

❸ State the amplitude, period, phase shift, and vertical shift for $y = 4\cos\left(\frac{\theta}{2} + \pi\right) - 6$. Then graph the function.

Vertical Shift of Sine and Cosine Functions

Vertical Shift of Sine and Cosine Functions

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

Examples

Find the value of k, c, amplitude, period, phase shift, and vertical shift of the sinusoidal function.

$$y = 2\cos(4x + 3f) + 1$$

k N   , c N

Amplitude : $|A|$ N

Period : T N $\dfrac{2f}{k}$ N

Phase Shift : $\dfrac{c}{k}$ N

Examples

Find the value of k, c, amplitude, period, and vertical shift of the sinusoidal function.

$$y = -\frac{2}{3}\sin\left(-\frac{1}{2}f\,x + \frac{f}{4}\right)$$

k N   , c N

Amplitude : $|A|$ N

Period : T N $\dfrac{2f}{k}$ N

Phase Shift : $\dfrac{c}{k}$ N

Examples

Write an equation of the sine function with each amplitude, period, phase shift, and vertical shift.

amplitude – 7, period – 3π, phase shift – π, vertical shift – -7
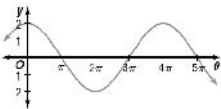

Examples

Write an equation of the sine function with each amplitude, period, phase shift, and vertical shift.

amplitude – $\dfrac{3}{4}$, period – $\dfrac{\pi}{5}$, phase shift – π, vertical shift – $\dfrac{1}{4}$

Examples

Write an equation of the cosine function with each amplitude, period, phase shift, and vertical shift.

amplitude $\dfrac{4}{5}$, period $\dfrac{\pi}{6}$, phase shift $\dfrac{\pi}{5}$, vertical shift $\dfrac{7}{5}$

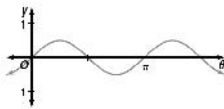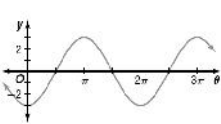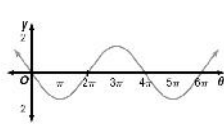## Examples
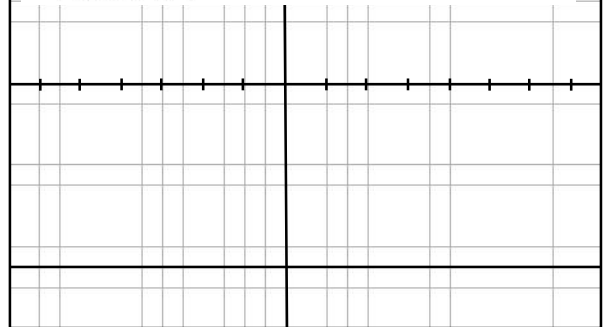
Write an equation for each graph.

1)

2)

3)

4)

Examples

State the amplitude, period, phase shift, and vertical shift for each function. Then graph the function.

1) $y = 2\sin(2\theta + \pi) - 5$

Examples

State the amplitude, period, phase shift, and vertical shift for each function. Then graph the function.

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

Graphs of Trigonometric Functions

	Amplitude	Period	Phase Shift	Sub-Interval Width	Interval defining ONE cycle	Key points
$y = -3\tan\left(2_x - f\right)$				XXX	XXX	

Examples

1)   2)

3)   4)