NOTES

$y = a\sin(bx) + k$

$y = a\cos(bx) + k$

a Vertical stretch/shrink = Amplitude

b Horizontal stretch or shrink Period = $2\pi/b$

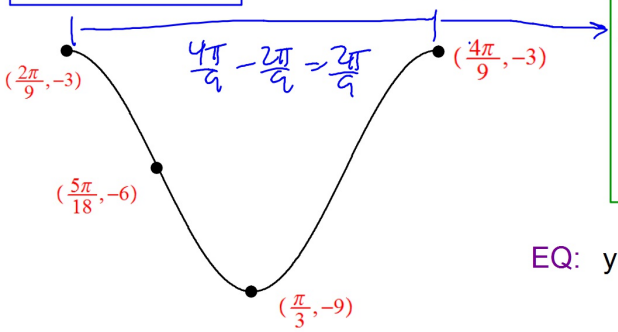
k Veritcal shift = Midline

Amplitude = 3

a = 3

Midline: y = −6

k = −6



Period = $\frac{2\pi}{9}$

$b = \frac{2\pi}{\frac{2\pi}{9}} = 2\pi \cdot \frac{9}{2\pi}$

$b = 9$

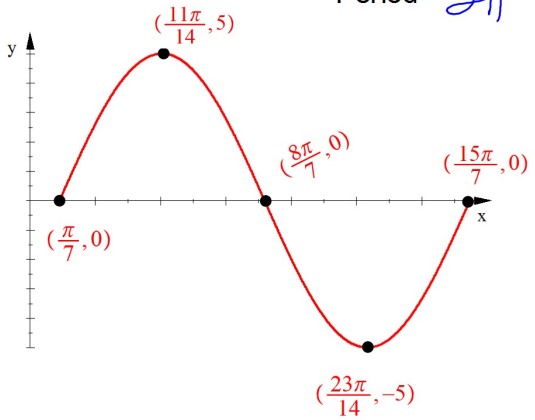
EQ: $y = 3\cos 9x - 6$

$y = a\sin(x-h) + k$

$y = a\cos(x-h) + k$

h Horizontal Shift: Phase Shift

Period = 2π

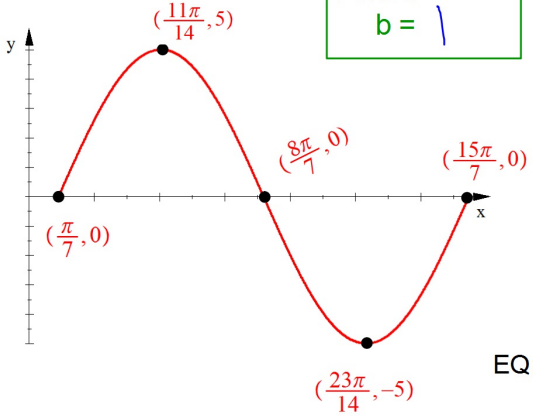


Amplitude = 5

Midline: y = 0

Phase Shift:

$\frac{\pi}{7}$ RIGHT



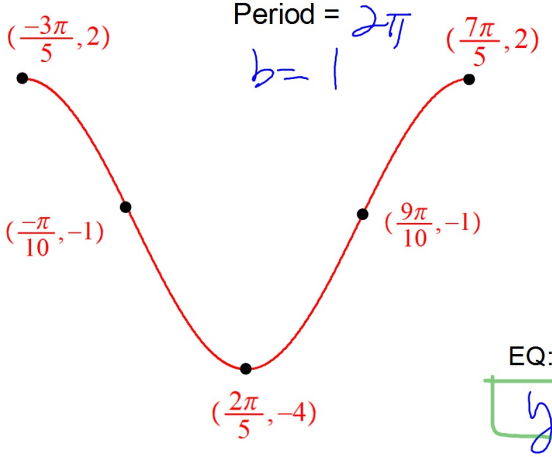
Period = 2π
b = 1

Amplitude = 5
a = 5

Midline: y = 0
k = 0

Phase Shift: $\frac{\pi}{7}$ right
$(x \pm h) \longrightarrow x - \frac{\pi}{7}$

EQ: $y = 5\sin\left(x - \frac{\pi}{7}\right)$



Period = 2π
$b = 1$

Amplitude = 3
$a = 3$

Midline: $y = -1$

Phase Shift:
$\frac{3\pi}{5}$ Left

EQ:
$y = 3\cos\left(x + \frac{3\pi}{5}\right) - 1$

$y = \sin bx$

b affects the period
(horiz stretch or shrink)

$y = \sin(x - h)$

h affects the horizontal position.
(horiz translation left or right)

How do you write an equation that has both a b and an h?

$y = \sin(b(x-h))$

Describe any phase shift and vertical shift.

vert stretch = Amp

$y = -8\cos(3(x + \frac{\pi}{6})) - 5$

5 down
midline
$y = -5$

upside down

$\frac{\pi}{6}$ Left (Phase Shift)

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

Write the equation of each function.

Parent function: Cosx Phase Shift: $\frac{3\pi}{4}$ right Period = $\frac{2\pi}{9}$

$b = 9$

Vertical Stretch factor of 7

$y = 7\cos 9\left(x - \frac{3\pi}{4}\right)$

Parent function: Sinx Phase Shift: $\frac{\pi}{6}$ left Period = 8π

Graph is upside-down

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

$y = -\sin\frac{1}{4}\left(x + \frac{\pi}{6}\right)$

State the period and the phase shift each equation represents.

$y = -12\sin(3(x + \frac{7\pi}{10}))$

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

Phase Shift: $\frac{7\pi}{10}$ Left

$y = 8\cos(4x - 3\pi)$

$b(x-h)$

Period = $\frac{2\pi}{4} = \frac{\pi}{2}$

Phase Shift: $\frac{3\pi}{4}$ RIGHT

$y = a\sin(b(x-h)) + k$

$y = a\cos(b(x-h)) + k$

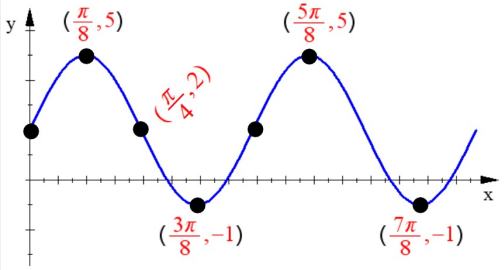
a ⟶ Amplitude - Vert strecth or shrink

b ⟶ Leads to the Period = 2π/b - Horiz stretch or shrink

h ⟶ Phase Shift - Horiz translation - gives the "new" starting point

k ⟶ Equation of the Midline - Vert translation

Write the equation of this graph as a Cosine Function:



Amplitude= 3

Period = π/2 $\frac{2\pi}{\frac{\pi}{2}}$

$b = 4$

Midline: y=2

If use this as the starting point $(\frac{\pi}{8}, 5)$

$y = 3\cos 4\left(x - \frac{\pi}{8}\right) + 2$

Equation: