5.4 Graphing $y = a\sin\frac{2\pi}{p}(x-c)+d$ and $y = a\cos\frac{2\pi}{p}(x-c)+d$

When graphing $y=\sin bx$ or $y=\cos bx$, the period is $\frac{2\pi}{b}$. For example, the period of $y=\sin(3x)$ is $\frac{2\pi}{3}$. However, when the function is of the form $y=\sin\frac{2\pi}{p}x$, the period is *p*.

For example, find the period of: $y=\sin\frac{2\pi}{10}x$. $\frac{2\pi}{\frac{2\pi}{10}} = 2\pi\left(\frac{10}{2\pi}\right) = 10$

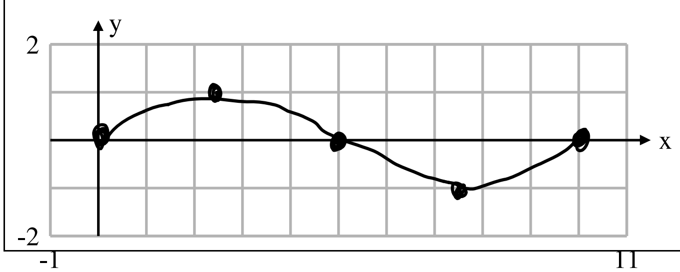
→ period

Do it quickly → find the period:

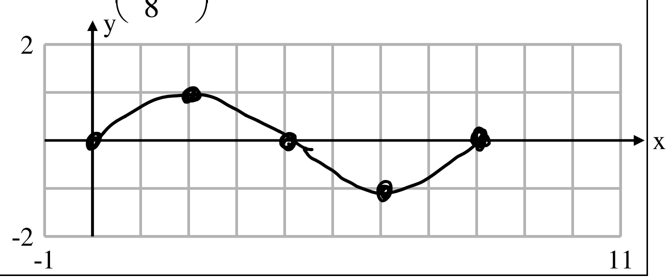
$y=\sin\left(\frac{2\pi}{9}x\right)$ $p=9$	$y=\cos\left(\frac{2\pi}{7}x\right)$ $p=7$	$y=\sin\left(\frac{\pi}{6}x\right)$ $p=12$	$y=\sin(\pi x)$ $p=2$

Graph:

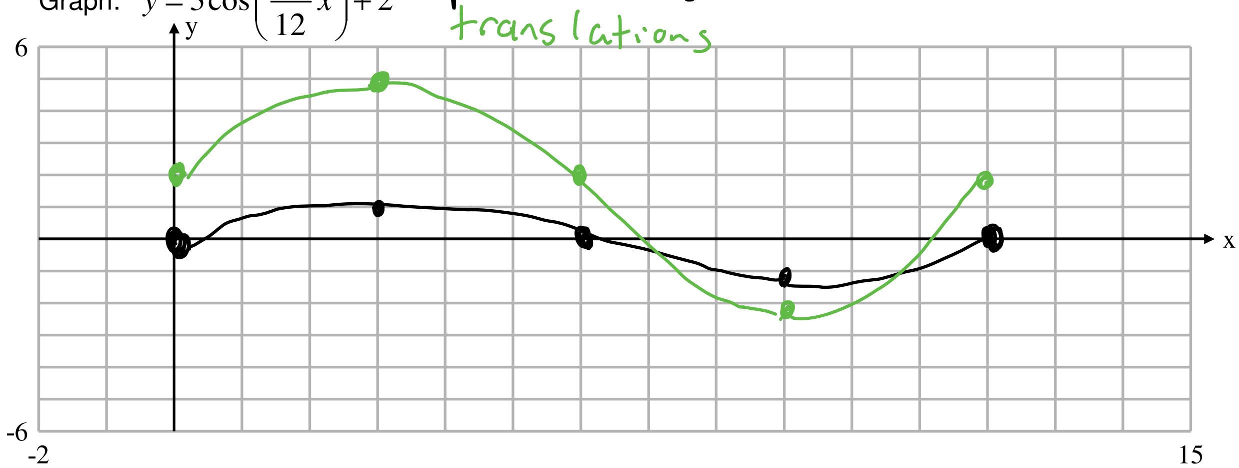
$y=\sin\left(\frac{2\pi}{10}x\right)$



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



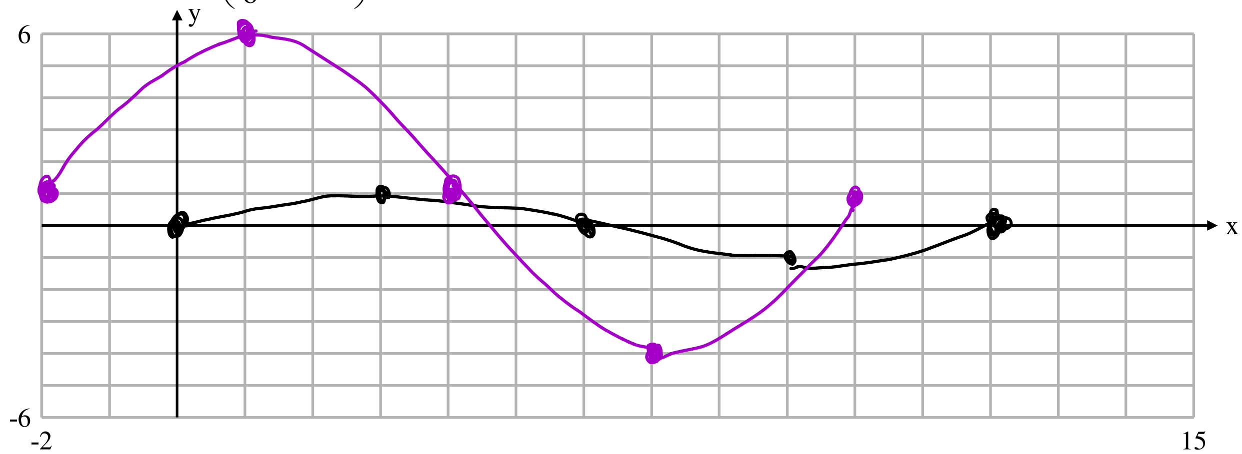
Graph: $y=3\cos\left(\frac{2\pi}{12}x\right)+2$ period change
translations



period change

translations

Graph: $y = 5\sin\left(\frac{\pi}{6}(x+2)\right)+1$



A sinusoidal (sine &/or cosine function) has a first maximum at (2, 10) and has a first minimum at (4, -2).

a. Write a sine function for this situation

b. Write a cosine function for this situation.

$\cos\theta$

→ First Max @ $x = 2$

∴ shifted right 2

∴ $c = -2$

→ Period $= 2$

∴ $b = \frac{2\pi}{2} = \pi$

→ Amplitude $= 6$

∴ $a = 6$

→ shifted up 4

$y = 6\cos(\pi x) + 4$

$\sin\theta$

Lazy way!

Sin is the same as cosine but shifted by $-\frac{\pi}{2}$

* take into account new period (6)

∴

$y = 6\sin\pi\left(x + \frac{1}{2}\right) + 4$