Graphing Sine and Cosine Functions with Phase Shifts (Horizontal Shifts)

$y = \cos(B(x+K))$

$y = \sin(B(x+K))$

Horizontal Shifts

$y = f(x+b)$ shift left b units

$y = f(x-b)$ shift right b units

$y = f(x-4)$

a) $y = \cos(x-4)$; Cosine shifted 4 units to the right

$y = f[(x+1)]$; Sine shifted 1 unit to the left

b) $y = \sin[2(x+1)]$

c) $y = \cos(10x + 30)$

$y = \cos[10(x+3)]$

$y = f[10(x+3)]$; cosine shifted 3 units to the left

Find Amplitude and Period

$y = A\cos(Bx)$

$y = A\sin(Bx)$

Amplitude is $|A|$

Period is $\frac{2\pi}{|B|}$

a) $y = -4\cos(3x)$

Amp $= |-4|$

$= 4$

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

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

b) $y = \frac{1}{2}\sin(x)$

Amp $= \left|\frac{1}{2}\right|$

$= \frac{1}{2}$

Period $= \frac{2\pi}{|1|}$

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

$= 2\pi$

c. $y = \sqrt{2}\cos\left(\frac{1}{2}x\right)$

Amp $= |\sqrt{2}|$

$= \sqrt{2}$

Period $= \frac{2\pi}{\left|\frac{1}{2}\right|}$

$= \frac{2\pi}{\frac{1}{2}} \rightarrow 2\pi \div \frac{1}{2} \rightarrow 2\pi \cdot \frac{2}{1} = 4\pi$