Example: $y = \frac{1}{2}\sin\left(x - \frac{\pi}{3}\right)$ (Remember APTEV)

Formulas for General Form $y = a\sin(bx - c) + d$ **and** $y = a\cos(bx - c) + d$

amplitude = $|a| = \left|\frac{1}{2}\right| = \frac{1}{2}$

period (of sine and cosine) = $\frac{2\pi}{b} = \frac{2\pi}{1} = 2\pi$

tick marks = $\frac{\text{period}}{4} = \frac{2\pi}{4} = \frac{\pi}{2}$

tick mark calculations:

(1) $\frac{\pi}{3}$

(2) $\frac{\pi}{3} + \frac{\pi}{2} = \frac{5\pi}{6}$

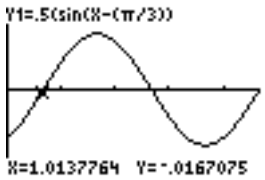
(3) $\frac{5\pi}{6} + \frac{\pi}{2} = \frac{8\pi}{6} = \frac{4\pi}{3}$

(4) $\frac{4\pi}{3} + \frac{\pi}{2} = \frac{11\pi}{6}$

(5) $\frac{11\pi}{6} + \frac{\pi}{2} = \frac{7\pi}{3}$

endpoints Solve:

$bx - c = 0$	$bx - c = 2\pi$
$x - \frac{\pi}{3} = 0$	$x - \frac{\pi}{3} = 2\pi$
$x = \frac{\pi}{3}$	$x = \frac{\pi}{3} + \frac{6\pi}{3} = \frac{7\pi}{3}$
(starts)	(ends)



vertical shift = d = none

Example: $y = 3\cos(2x) + 2$ (Remember APTEV)

Formulas for General Form $y = a\sin(bx - c) + d$ **and** $y = a\cos(bx - c) + d$

amplitude = $|a| = |3| = 3$

period (of sine and cosine) = $\frac{2\pi}{b} = \frac{2\pi}{2} = \pi$

tick marks = $\frac{\text{period}}{4} = \frac{\pi}{4}$

tick mark calculations:

(1) 0

(2) $0 + \frac{\pi}{4} = \frac{\pi}{4}$

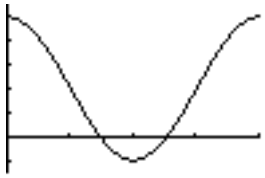
(3) $\frac{\pi}{4} + \frac{\pi}{4} = \frac{\pi}{2}$

(4) $\frac{\pi}{2} + \frac{\pi}{4} = \frac{3\pi}{4}$

(5) $\frac{3\pi}{4} + \frac{\pi}{4} = \frac{4\pi}{4} = \pi$

endpoints Solve:

$bx - c = 0$	$bx - c = 2\pi$
$2x - 0 = 0$	$2x - 0 = 2\pi$
$x = 0$	$x = \pi$
(starts)	(ends)



vertical shift = $d = 2$

Example: $y = -3\cos(2\pi x + 4\pi)$ (Remember APTEV)

Formulas for General Form $y = a\sin(bx - c) + d$ **and** $y = a\cos(bx - c) + d$

amplitude = $|a| = |-3| = 3$

period (of sine and cosine) = $\frac{2\pi}{b} = \frac{2\pi}{2\pi} = 1$

tick marks = $\frac{\text{period}}{4} = \frac{1}{4}$

tick mark calculations:

(1) -2

(2) $-2 + \frac{1}{4} = \frac{-7}{4}$

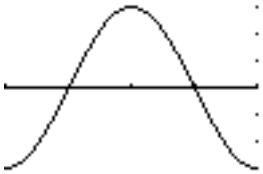
(3) $\frac{-7}{4} + \frac{1}{4} = \frac{-6}{4} = \frac{-3}{2}$

(4) $\frac{-3}{2} + \frac{1}{4} = \frac{-5}{4}$

(5) $\frac{-5}{4} + \frac{1}{4} = -1$

endpoints Solve:

$bx - c = 0$	$bx - c = 2\pi$
$2\pi x + 4\pi = 0$	$2\pi x + 4\pi = 2\pi$
$2\pi x = -4\pi$	$2\pi x = -2\pi$
$x = -2$	$x = -1$
(starts)	(ends)



vertical shift = d = none