General Form: $y = a \sin k(x - b) + c$

Amplitude: $|a|$

Period: $\dfrac{2\pi}{k}$

Horizontal phase shift: b

Vertical phase shift: c

Step 1: Algebraically, arrange the given equation into the general form. $y = a \sin k(x - b) + c$

Step 2: By inspection, identify the amplitude, phase shifts and find the period using k.

Step 3: Plot the following five points:

Point 1: (b, c) Point 2: $\left(b + \dfrac{\pi}{2k}, a + c\right)$ Point 3: $\left(b + \dfrac{\pi}{k}, c\right)$

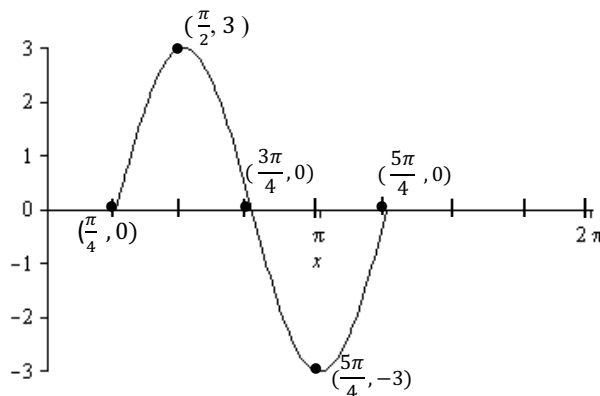Point 4: $\left(b + \dfrac{3\pi}{2k}, -a + c\right)$ Point 5: $\left(b + \dfrac{2\pi}{k}, c\right)$

EXAMPLE :   Given $y = 3 \sin\left(2x - \dfrac{2\pi}{4}\right)$, graph the sine function.

Step 1: By factoring out a 2, we get an equation in the general form: $y = 3 \sin 2\left(x - \dfrac{\pi}{4}\right)$

Step 2: By inspection, $a = 3$; $b = \dfrac{\pi}{4}$; $c = 0$; $k = 2$; $Period = \dfrac{2\pi}{k} = \dfrac{2\pi}{2} = \pi$

Step 3: Plot   Pt1: $\left(\dfrac{\pi}{4}, 0\right)$ Pt2: $\left(\dfrac{\pi}{2}, 3\right)$ Pt3: $\left(\dfrac{3\pi}{4}, 0\right)$ Pt4: $\left(\dfrac{5\pi}{4}, -3\right)$ Pt5: $\left(\dfrac{5\pi}{4}, 0\right)$
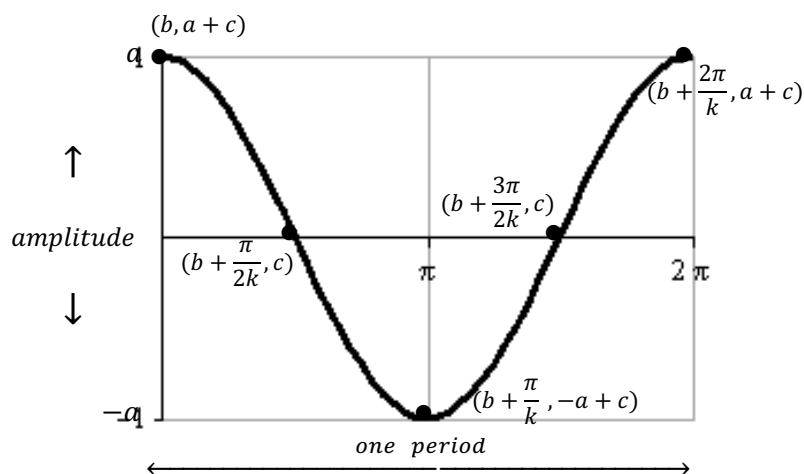
COSINE GRAPH   STEM SC   CALCULUS

General Form: $\ y = a\cos k(x - b) + c$

Amplitude: $|a|$

Period: $\dfrac{2\pi}{k}$

Horizontal phase shift: b

Vertical phase shift: c

Step 1: Algebraically, arrange the given equation into the general form. $\ y = a\cos k(x - b) + c$

Step 2: By inspection, identify the amplitude, phase shifts and find the period using k.

Step 3: Plot the following five points:

Point 1: $(b, a + c)$ Point 2: $\left(b + \dfrac{\pi}{2k}, c\right)$ Point 3: $\left(b + \dfrac{\pi}{k}, -a + c\right)$

Point 4: $\left(b + \dfrac{3\pi}{2k}, c\right)$ Point 5: $\left(b + \dfrac{2\pi}{k}, a + c\right)$

EXAMPLE :   Given $\ y = \ 5\cos\left(3x + \dfrac{3\pi}{2}\right) + 1$, graph the cosine function.

Step 1: By factoring out a 3, we can rewrite equation in the general form as $\ y = 5\cos 3\left(x - \left(-\dfrac{\pi}{2}\right)\right) + 1$

Step 2: By inspection, $a = 5;\ \ b = -\dfrac{\pi}{2};\ \ c = 1;\ \ k = 3;\ \ Period = \dfrac{2\pi}{k} = \dfrac{2\pi}{3}$

Step 3: Plot   Pt1: $\left(-\dfrac{\pi}{2}, 6\right)$ Pt2: $\left(-\dfrac{\pi}{3}, 1\right)$ Pt3: $\left(-\dfrac{\pi}{6}, -4\right)$ Pt4: $(0, 1)$ Pt5: $\left(\dfrac{\pi}{6}, 6\right)$

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