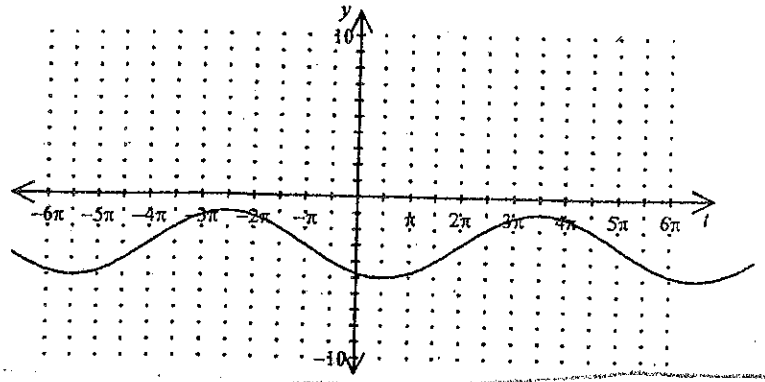
4. **Find the equation of the functions below:**

A.



- Any sinusoidal function can be written as an infinite number of sine or cosine graphs.
- $y = \pm\sin$ or $y = \pm\cos$ graphs

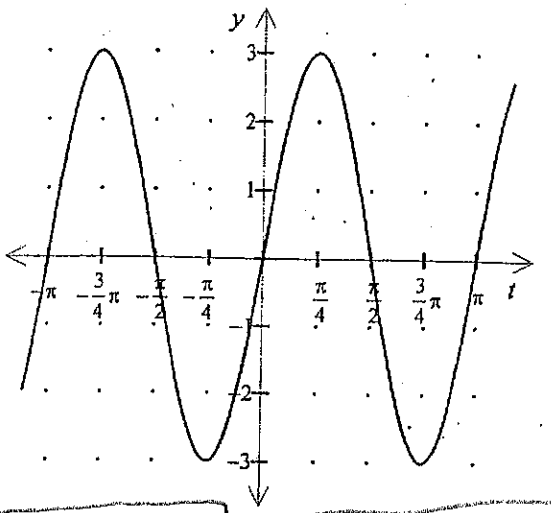
$y = -2\cos\left(\frac{1}{3}x - \frac{\pi}{6}\right) - 3$

$y = 2\sin\left(\frac{1}{3}x - \frac{2\pi}{3}\right) - 3$ | $y = -2\sin\left(\frac{1}{3}x + \frac{\pi}{3}\right) - 3$ | $y = 2\cos\left(\frac{1}{3}x - \frac{7\pi}{6}\right) - 3$

STEPS for fitting data to a sine or cosine function:

(+) Sine	(-) Sine	(+) Cosine	(-) Cosine
Find A & determine if A is pos. or neg. $\frac{max - min}{2}$	$A = \frac{-1-(-5)}{2} = 3$ A = -3 b/c it's a (-) sine	$A = \frac{-1-(-5)}{2} = 3$ A = 3 b/c it's a (+) cosine	$A = \frac{-1-(-5)}{2} = 3$ A = -3 b/c it's a (-) cosine
$b = \frac{2\pi}{period}$	$b = \frac{2\pi}{6\pi} = \frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
Phase shift ① Find increment $inc = \frac{per}{4}$ ② PS will be (x-coordinate of 1st max) − (increment) ↓ to the right of y-axis	Phase shift ① Find increment $inc = \frac{per}{4}$ ② PS will be (x-coord of 1st max to (L) of y-axis) + (inc)	Phase shift ① PS will be x-coord of max (1st one to the right of the y-axis)	Phase shift ① PS will be x-coordinate of min (1st one to the right of the y-axis)
$c = b \cdot ps$	$c = \frac{1}{3} \cdot -\pi = \frac{-\pi}{3}$	$c = \frac{1}{3} \cdot \frac{7\pi}{2} = \frac{7\pi}{6}$	$c = \frac{1}{3} \cdot \frac{\pi}{2} = \frac{\pi}{6}$
$d = \frac{(max+min)}{2}$	$d = \frac{-1+-5}{2} = -3$	-3	-3

B.



- Any sinusoidal function can be written as an infinite number of sine or cosine graphs.
- $y = \pm\sin$ or $y = \pm\cos$ graphs

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

STEPS for fitting data to a sine or cosine function:

(+) Sine	(-) Sine	(+) Cosine	(-) Cosine
Find A & determine if A is pos. or neg. $\frac{\text{max} - \text{min}}{2}$	$\frac{3 - -3}{2} = 3$ $A = -3$	$\frac{3 - -3}{2} = 3$ $A = 3$	$\frac{3 - -3}{2} = 3$ $A = -3$
$b = \frac{2\pi}{\text{period}}$	$b = \frac{2\pi}{\pi} = 2$	2	2
Phase shift ① Find increment $\text{inc} = \frac{\text{per}}{4}$	Phase shift ① Find increment $\text{inc} = \frac{\text{per}}{4}$	Phase shift ① PS will be x-coord of max (1st one to the right of the y-axis)	Phase shift ① PS will be x-coordinate of min (1st one to the right of the y-axis)
② PS will be x-coordinate of 1st max) − (increment) ↓ to the right of y-axis	② PS will be (x-coord of 1st max to the left of y-axis) + (inc)		
$c = b \cdot ps$	$c = 2 \cdot -\frac{\pi}{2} = -\pi$	$c = 2 \cdot \frac{\pi}{4} = \frac{\pi}{2}$	$c = 2 \cdot \frac{3\pi}{4} = \frac{6\pi}{4} = \frac{3\pi}{2}$
$d = \frac{(\text{max} + \text{min})}{2}$	$d = \frac{3 + -3}{2} = 0$	0	0