Key

2.07c Review WS #3 Graphing Sine and Cosine

$y = -2\cos\left[\frac{1}{4}(\theta + 12\pi)\right] - 5$

1. Describe the transformations that change the graph of the first function into the graph of the second. $y = \cos\theta$ and $y = -2\cos\left(\frac{\theta}{4} + 3\pi\right) - 5$

$a = -2$ $\quad c = 3\pi$

$b = 1/4$ $\quad d = -5$

$\text{period} = \frac{2\pi}{1/4} = 2\pi \cdot \frac{4}{1} = 8\pi$

* reflection over x-axis
* vertical stretch factor of 2
* horizontal stretch factor of 4
* shift left 12π units
* shift down 5 units

2. Write a cosine function with amplitude = 2, reflection over x-axis, period = $\frac{2\pi}{3}$, phase shift left $\frac{\pi}{2}$, and vertical shift up 12 units

$\frac{2\pi}{3} = \frac{2\pi}{b}$ $\quad 2\pi b = 6\pi$ $\quad b = \frac{6\pi}{2\pi} = 3$

$a = -2$, $b = 3$, $c = \pi/2$, $d = 12$

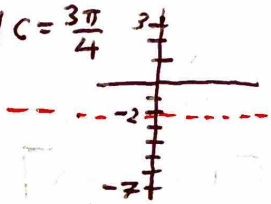
$y = -2\cos\left[3(\theta + \pi/2)\right] + 12$

3. **Write** a sine equation that completes one quarter of its period in 3π, has been shifted right $\frac{3\pi}{4}$ units, has a minimum value of -7, and a maximum value of 3.

3π 3π 3π 3π — period $= 12\pi$

$\text{period} = \frac{2\pi}{b}$ $\quad 12\pi = \frac{2\pi}{b}$ $\quad 12\pi b = 2\pi$ $\quad b = \frac{2\pi}{12\pi}$ $\quad b = \frac{1}{6}$

$c = \frac{3\pi}{4}$



$a = 5$, $d = -2$

$y = a\sin\left[b(\theta + c)\right] + d$

$y = 5\sin\left[\frac{1}{6}(\theta - \frac{3\pi}{4})\right] - 2$

4. Write the amplitude, period, phase shift, and vertical shift of each function. Then graph at least one period of the function.

a. $y = -3\cos\left(3\theta + \frac{3\pi}{4}\right) - 1$

$y = -3\cos\left[3(\theta + \frac{\pi}{4})\right] - 1$

$b = 3$

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

$I = \frac{1}{4} \cdot \frac{2}{3}\pi = \frac{2\pi}{12} = \frac{\pi}{6}$

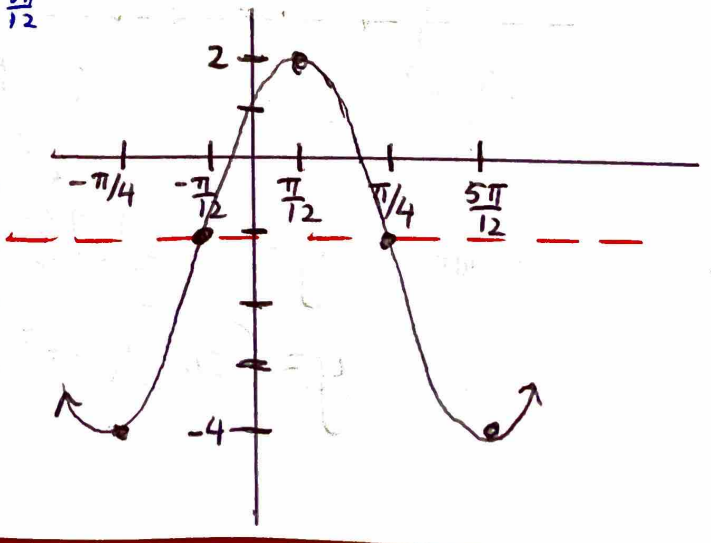
amplitude: 3 period: $2\pi/3$ phase shift: left $\pi/4$ vertical shift: down 1

Domain: $(-\infty, \infty)$ Range: $[-4, 2]$

Graph:

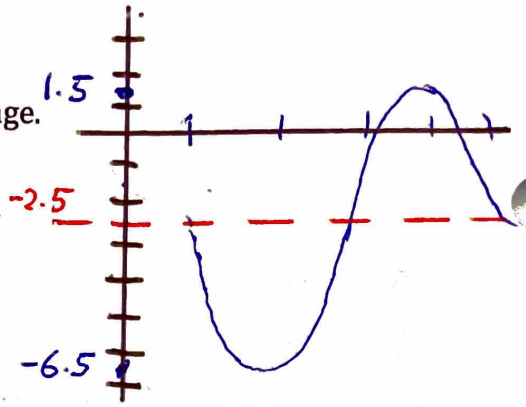
$8\pi/12 - 3\pi/12 = 5\pi/12$

	$-\pi/4$	$2\pi/12 - 3\pi/12 = -\pi/12$	$4\pi/12 - 3\pi/12 = \pi/12$	$6\pi/12 - 3\pi/12 = 3\pi/12$	
	$0 - \pi/4$	$\pi/6 - \pi/4$	$2\pi/6 - \pi/4$	$3\pi/6 - \pi/4$	$4\pi/6 - \pi/4$
$\cos(3\theta)$	1	0	-1	0	1
$-3\cos(3\theta)$	-3	0	3	0	-3



5. For $y = -4\sin(5\theta - 2\pi) - 2.5$, determine the domain & range.

Domain: $(-\infty, \infty)$ Range: $[-6.5, 1.5]$

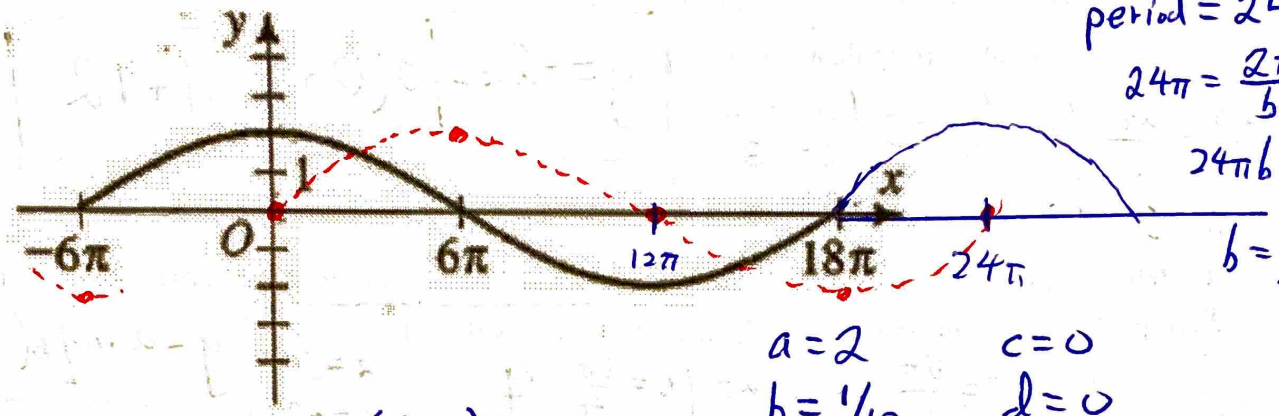


$a = -4$

$d = -2.5$

6. State both a cosine function and sine function that would represent the graph below.

a)



period $= 24\pi$

$24\pi = \frac{2\pi}{b}$

$24\pi b = 2\pi$

$b = \frac{2\pi}{24\pi} = \frac{1}{12}$

$a = 2$ $c = 0$

$b = 1/12$ $d = 0$

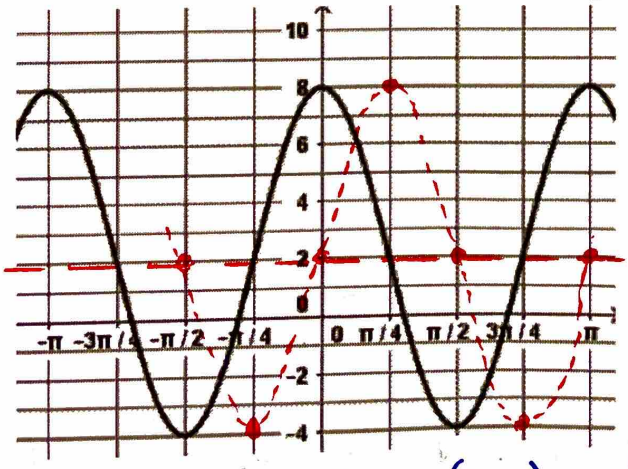
Using cosine: $y = 2\cos\left(\frac{1}{12}\theta\right)$

$a = 2$ $c = +6\pi$

$b = \frac{1}{12}$ $d = 0$

Using sine: $y = 2\sin\left[\frac{1}{12}(\theta + 6\pi)\right]$

b)



period $= \pi$

$\pi = \frac{2\pi}{b} \rightarrow b\pi = 2\pi \rightarrow b = 2$

$a = 6$ $c = 0$

$b = 2$ $d = 2$

Using cosine: $y = 6\cos(2\theta) + d$

$a = 6$ $c = +\pi/4$

$b = 2$ $d = 2$

Using sine: $y = 6\sin\left[2(\theta + \pi/4)\right] + 2$