NAME Answer Key DATE _____ PERIOD _____

6-5

Practice

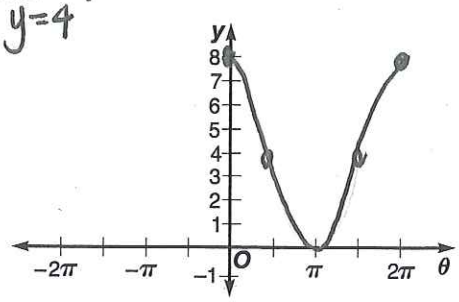
Translations of Sine and Cosine Functions

State the vertical shift and the equation of the midline for each function. Then graph each function.

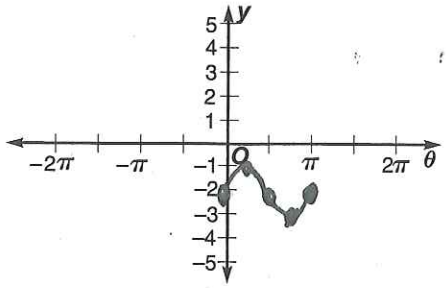
1. $y = 4\cos\theta + 4$ period $= 2\pi$

θ	$4\cos\theta+4$
0	8
$\pi/2$	4
π	0
$3\pi/2$	4
2π	8

VS. $= 4$, $y = 4$



2. $y = \sin 2\theta - 2$ VS $= 2$, $y = -2$ period $= \pi$

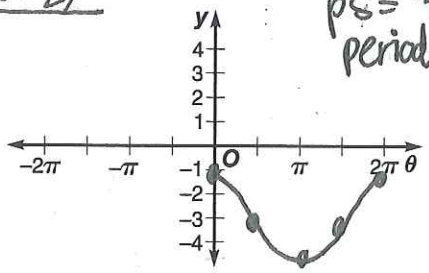


θ	$\sin 2\theta - 2$
0	−2
$\pi/4$	−1
$\pi/2$	−2
$3\pi/4$	−3
π	−2

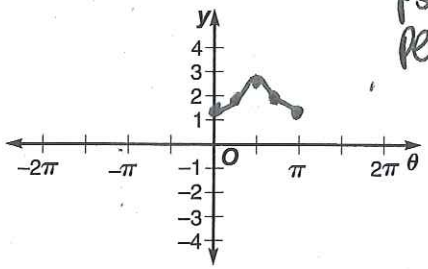
State the amplitude, period, phase shift, and vertical shift for each function. Then graph the function.

3. $y = 2\sin\left(\theta + \frac{\pi}{2}\right) - 3$ Amp $= 2$, VS $= -3$, PS $= -\pi/2$, period $= 2\pi$

θ	$2\sin(\theta+\frac{\pi}{2})-3$
0	−1
$\pi/2$	−3
π	−5
$3\pi/2$	−3
2π	−1



4. $y = \frac{1}{2}\cos(2\theta - \pi) + 2$ Amp $= \frac{1}{2}$, VS $= 2$, PS $= \pi/2$, period $= \pi$



θ	$\frac{1}{2}\cos(2\theta-\pi)+2$
0	1.5
$\pi/4$	2
$\pi/2$	2.5
$3\pi/4$	2
π	1.5

Write an equation of the specified function with each amplitude, period, phase shift, and vertical shift.

5. sine function: amplitude = 15, period = 4π, phase shift = $\frac{\pi}{2}$, vertical shift = -10

$y = \pm 15\sin\left(\frac{\theta}{2} - \frac{\pi}{4}\right) - 10$

$4\pi = \frac{2\pi}{K}$ $K = \frac{1}{2}$ $\frac{C}{K} = \frac{\pi}{2}$ $C = \frac{\pi}{4}$

$4\pi K = 2\pi$ $\frac{C}{1/2} = \frac{\pi}{2}$

6. cosine function: amplitude = $\frac{2}{3}$, period = $\frac{\pi}{3}$, phase shift = $-\frac{\pi}{3}$, vertical shift = 5

$y = \pm\frac{2}{3}\cos(6\theta + 2\pi) + 5$

$\frac{2\pi}{K} = \frac{\pi}{3}$ $6\pi = K\pi$ $K = 6$ $\frac{C}{6} = \frac{-\pi}{3}$ $C = -2\pi$

7. sine function: amplitude = 6, period = π, phase shift = 0, vertical shift = $-\frac{3}{2}$

$y = \pm 6\sin(2\theta - a) - \frac{3}{2}$

$y = \pm 6\sin 2\theta - \frac{3}{2}$

$\frac{2\pi}{K} = \pi$ $\frac{C}{2} = 0$

$K\pi = 2\pi$ $C = 0$

$K = 2$

State the phase shift for each function. Then graph each function.

1. $y = \sin(\theta - 2\pi)$ $PS = \frac{2\pi}{1} = 2\pi$

2. $y = 2\cos\left(\frac{\theta}{4} + \frac{\pi}{2}\right)$ $PS = \frac{-\pi/2}{1/4} = \frac{-\pi}{2} \cdot \frac{4}{1} = -2\pi$

State the vertical shift and the equation of the midline for each function. Then graph each function.

3. $y = 5\cos\theta - 4$

VS $= -4$
midline: $y = -4$

4. $y = 3\sin\frac{\theta}{2} + 4$

VS $= 4$ midline: $y = 4$

State the amplitude, period, phase shift, and vertical shift for each function. Then graph the function.

5. $y = 6\sin\left(\theta + \frac{\pi}{3}\right) + 2$

Amp $= 6$
period $= 2\pi$
PS $= -\pi/3$
VS $= 2$

6. $y = 20 + 5\cos(3\theta + \pi)$

Amp $= 5$
period $= 2\pi/3$ VS $= 20$
PS $= -\pi/3$

Write an equation of the sine function with each amplitude, period, phase shift, and vertical shift.

7. amplitude = 7, period = 3π, phase shift = π, vertical shift = -7

$y = \pm 7\sin\left(\frac{2}{3}\theta - \frac{2\pi}{3}\right) - 7$

$\frac{2\pi}{K} = \frac{3\pi}{1}$ $3\pi K = 2\pi$ $K = 2/3$

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

8. amplitude = $\frac{3}{4}$, period = $\frac{\pi}{5}$, phase shift = $-\pi$, vertical shift = $\frac{1}{4}$

$y = \pm\frac{3}{4}\sin(10\theta + 10\pi) + \frac{1}{4}$

$\frac{2\pi}{K} = \frac{\pi}{5}$ $K\pi = 10\pi$ $K = 10$

$\frac{C}{10} = -\pi$ $C = -10\pi$

Write an equation of the cosine function with each amplitude, period, phase shift, and vertical shift.

9. amplitude = $\frac{4}{5}$, period = $\frac{\pi}{6}$, phase shift = $\frac{\pi}{3}$, vertical shift = $\frac{7}{5}$

$\frac{2\pi}{K} = \frac{\pi}{6}$ $\pi K = 12\pi$ $K = 12$

$y = \pm\frac{4}{5}\cos(12\theta - 4\pi) + 7/5$

$\frac{C}{12} = \frac{\pi}{3}$ $C = 4\pi$

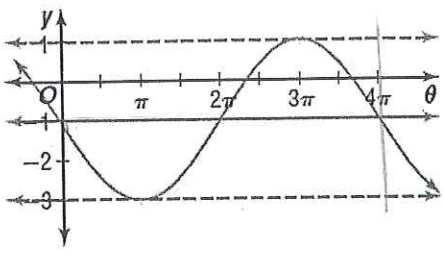
10. Amplitude = 25, period = 20, phase shift = 0, vertical shift = -90

$\frac{2\pi}{K} = \frac{20}{1}$ $2\pi = 20K$ $\frac{\pi}{10} = K$

$y = \pm 25\cos\left(\frac{\pi}{10}\theta - 0\right) - 90$

$y = \pm 25\cos\frac{\pi}{10}\theta - 90$

11. Write a cosine equation for the graph at the right.



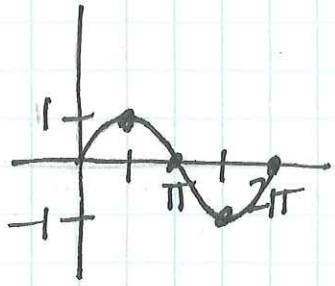
$y = -2\cos\left(\frac{\theta}{2} + 0\right) - 1$

$y = -2\cos\frac{\theta}{2} - 1$

$\frac{2\pi}{K} = \frac{4\pi}{1}$ $4\pi K = 2\pi$ $K = \frac{1}{2}$

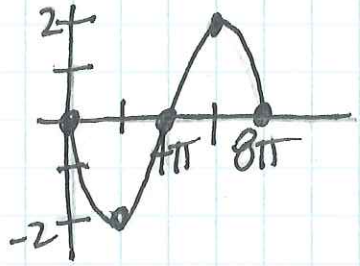
① $y = \sin(\theta - 2\pi)$ period $= 2\pi$

θ	$\sin(\theta - 2\pi)$
0	0
$\pi/2$	1
π	0
$3\pi/2$	-1
2π	0



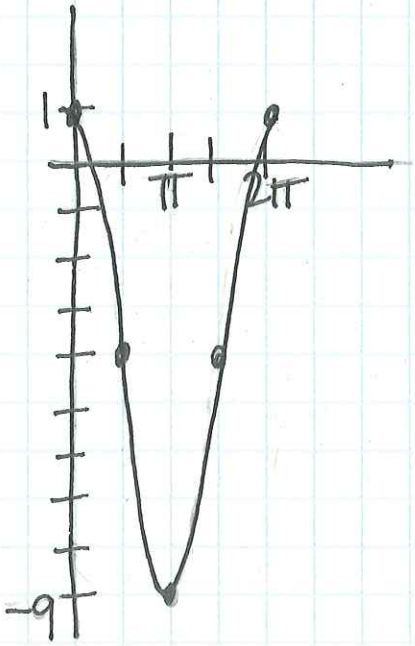
② $y = 2\cos\left(\frac{\theta}{4} + \frac{\pi}{2}\right)$ period $= \frac{2\pi}{1/4} = 8\pi$

θ	$2\cos\left(\frac{\theta}{4} + \frac{\pi}{2}\right)$
0	0
2π	-2
4π	0
6π	2
8π	0



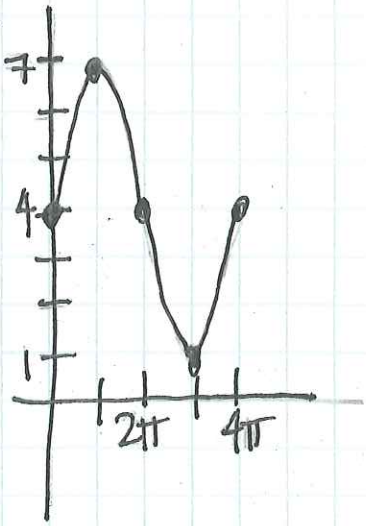
③ $y = 5\cos\theta - 4$ period $= 2\pi$

θ	$5\cos\theta - 4$
0	1
$\pi/2$	-4
π	-9
$3\pi/2$	-4
2π	1



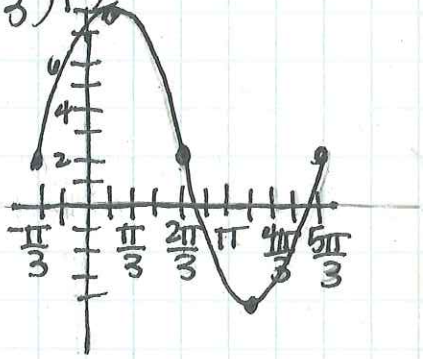
④ $y = 3\sin\frac{\theta}{2} + 4$ period $= \frac{2\pi}{1/2} = 4\pi$

θ	$3\sin\frac{\theta}{2} + 4$
0	4
π	7
2π	4
3π	1
4π	4



⑤ $y = 6\sin\left(\theta + \frac{\pi}{3}\right) + 2$

θ	
$0 \to -\pi/3$	2
$\pi/2 \to \pi/6$	8
$\pi \to 2\pi/3$	2
$3\pi/2 \to 7\pi/6$	-4
$2\pi \to 5\pi/3$	2



⑥ θ | $20 + 5\cos(3\theta + \pi)$ period $= 2\pi/3$

θ	$20 + 5\cos(3\theta + \pi)$
0	15
$\pi/6$	20
$\pi/3$	25
$\pi/2$	20
$2\pi/3$	15