Key

Unit 3 (4.8)Graphing All Dilations and Translations

$$y = A\sin[B(\theta - C)] + D$$

A

V.D.

Amplitude

If negative then reflection

B

HD $\left(HD = \frac{1}{B}\right)$

Period

$P = \frac{360 \text{ or } 2\pi}{B}$ $B = \frac{360 \text{ or } 2\pi}{P}$

C

HT

phase shift

(opposite)

D

VT

midline/ sinusoidal axis

Find the following then use the necessary information to write an equation of the trig function.

Sine curve in degrees with amplitude 4, horizontal dilation $\frac{1}{3}$, vertical translation 5 units

Amplitude: 4

Period: 120° ($P = \frac{360}{3}$)

Phase shift: —

Midline/Sinusoidal axis: $y = 5$

Horizontal Dilation: $\frac{1}{3}$ ($B = 3$)

Vertical Translation: 5

Horizontal Translation: —

Vertical Dilation: 4

Equation: $y = 4\sin 3\theta + 5$

Cosine curve with vertical dilation 3, period 4π, horizontal translation $-\frac{\pi}{2}$ units

Amplitude: 3

Period: 4π ($B = \frac{2\pi}{4\pi} = \frac{1}{2}$)

Phase shift: $-\pi/2$

Midline/Sinusoidal axis: —

Horizontal Dilation: 2 ($HD = \frac{1}{B}$)

Vertical Translation: —

Horizontal Translation: $-\pi/2$

Vertical Dilation: 3

Equation: $y = 3\cos\frac{1}{2}\left(x + \frac{\pi}{2}\right)$

Sine curve with amplitude $\frac{1}{2}$, period 240°, reflected over the x-axis, phase shift 60°, midline $y = -1$

Amplitude: 1/2

Period: 240° ($B = \frac{360}{240} = \frac{3}{2}$)

Phase shift: 60°

Midline/Sinusoidal axis: $y = -1$

Horizontal Dilation: 2/3 ($HD = \frac{1}{B}$)

Vertical Translation: -1

Horizontal Translation: 60°

Vertical Dilation: 1/2

Equation: $y = \frac{1}{2}\sin\left[\frac{3}{2}(\theta - 60°)\right] - 1$

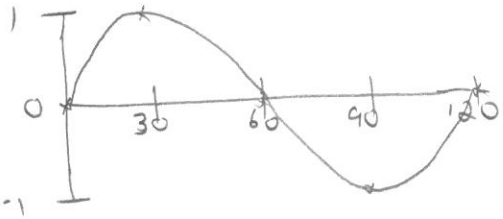
Example 1: State all transformations then graph one cycle. $y = 2\sin 3\theta$ $\frac{120}{4} = 30°$ 0, 30, 60, 90, 120

Vertical Dilation (Amplitude): 2

Horizontal Dilation: 1/3 Period: 120°

Vertical Translation: —

Horizontal Translation: —



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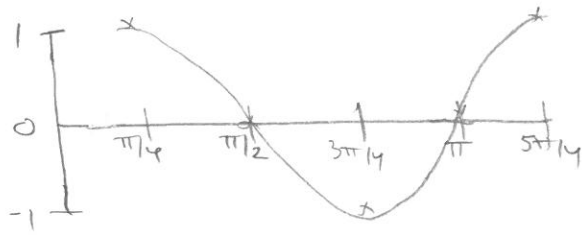
Example 2: State all transformations then graph one cycle. $y = \cos 2(x - \frac{\pi}{4})$ $\frac{\pi}{4}$ $\frac{\pi}{4}, \frac{2\pi}{4}, \frac{3\pi}{4}, \frac{4\pi}{4}, \frac{5\pi}{4}$

Vertical Dilation (Amplitude): 1

Horizontal Dilation: _____ Period: π

Vertical Translation: —

Horizontal Translation: $\pi/4$



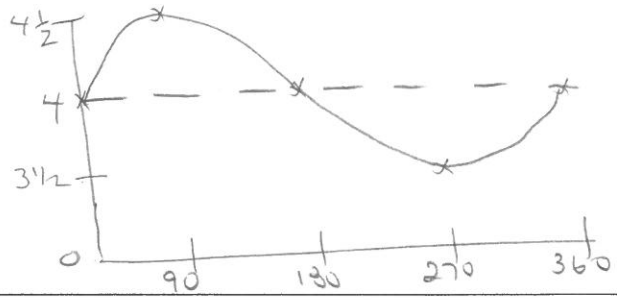
Example 3: State all transformations then graph one cycle. $y = \frac{1}{2}\sin(\theta) + 4$ $\frac{360°}{4} = 90°$ 0, 90, 180, 270, 360

Vertical Dilation (Amplitude): 1/2

Horizontal Dilation: 1 Period: 360°

Vertical Translation: 4

Horizontal Translation: —



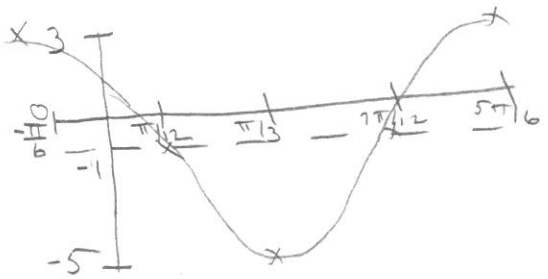
Example 4: State all transformations then graph one cycle. $y = 4\cos[2\left(x + \frac{\pi}{6}\right)] - 1$ $\frac{\pi}{4}$ or $\frac{3\pi}{12}$ $-\pi/6$ or $-2\pi/12$ $-2\pi/12, \pi/12, \frac{4\pi}{12}, \frac{7\pi}{12}, \frac{10\pi}{12}$

Vertical Dilation (Amplitude): 4

Horizontal Dilation: 1/2 Period: π

Vertical Translation: -1

Horizontal Translation: $-\pi/6$



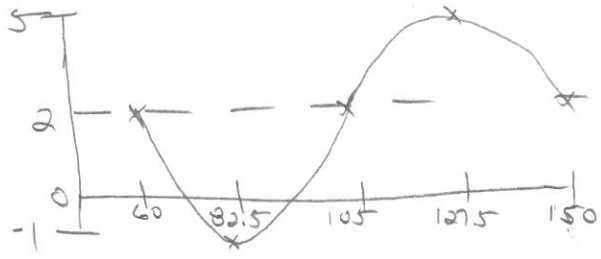
Example 5: State all transformations then graph one cycle. $y = -3\sin[4(\theta - 60°)] + 2$ $\frac{90}{4} = 22.5$ 60, 82.5, 105, 127.5, 150

Vertical Dilation (Amplitude): 3

Horizontal Dilation: 1/4 Period: 90°

Vertical Translation: 2

Horizontal Translation: 60°



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Example 6: State all transformations then graph one cycle. $y = 2\sin\left[\frac{1}{3}\left(x+\frac{\pi}{2}\right)\right] - 3$

$\frac{6\pi}{4}; \frac{3\pi}{2}$

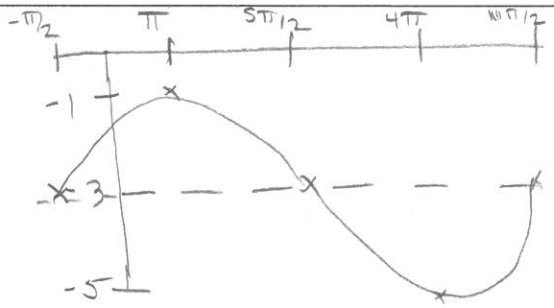
$-\frac{\pi}{2}, \frac{2\pi}{2}, \frac{5\pi}{2}, \frac{8\pi}{2}, \frac{11\pi}{2}$

Vertical Dilation (Amplitude): 2

Horizontal Dilation: 3 Period: 6π

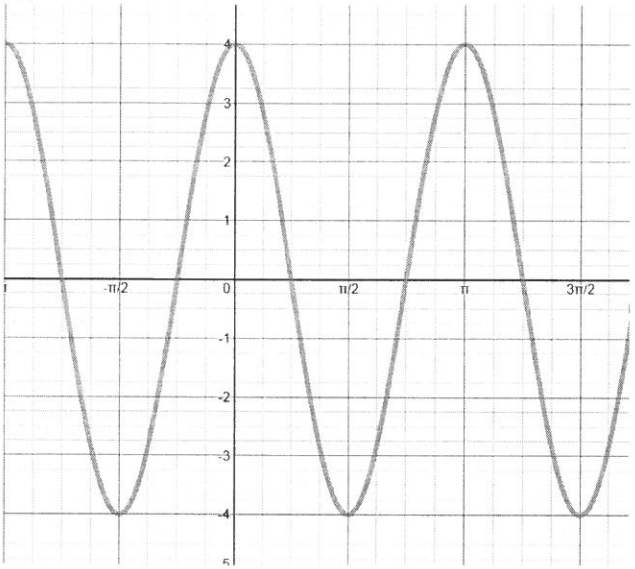
Vertical Translation: -3

Horizontal Translation: $-\pi/2$



Example 7: Write both a sine and cosine equation that models the graph.

A.



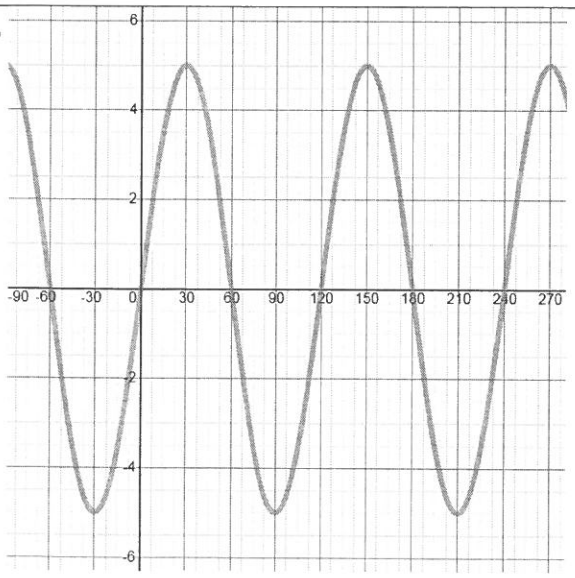
$y = 4\cos 2x$

$y = 4\sin 2\left(x+\frac{\pi}{4}\right)$

$y = -4\cos 2\left(x-\frac{\pi}{2}\right)$

$y = -4\sin 2\left(x-\frac{\pi}{4}\right)$

B.



$y = 5\sin 3\theta$

$y = 5\cos[3(\theta - 30^\circ)]$

$y = -5\sin[3(\theta - 60^\circ)]$

$y = -5\cos[3(\theta - 90^\circ)]$

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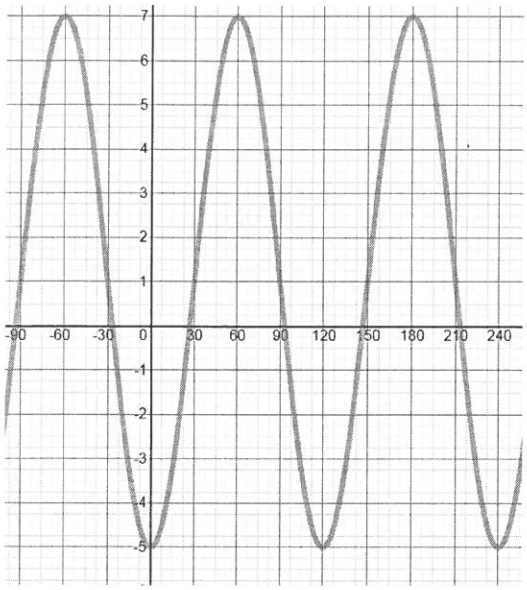
C.



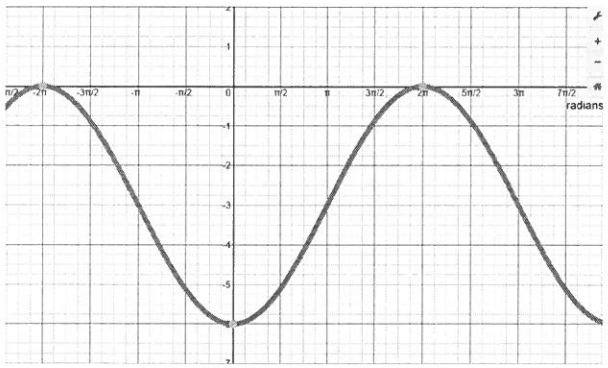
$y = 6\sin 3(\theta - 30^\circ) + 1$

$y = 6\cos 3(\theta - 60^\circ) + 1$

$y = -6\sin 3(\theta - 90^\circ) + 1$

$y = -6\cos 3\theta + 1$

D.



$y = 3\sin\left[\frac{1}{2}(x - \pi)\right] - 3$

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

$y = -3\sin\left[\frac{1}{2}(x + \pi)\right] - 3$

$y = -3\cos\frac{1}{2}x - 3$