

# 5.3 Transformations of Sine and Cosine Worksheet #1

MCR3U

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SOLUTIONS

**Instructions:** For each of the following start with two cycles of the parent graph (-360 to 360). Transform key points to produce the new graph.

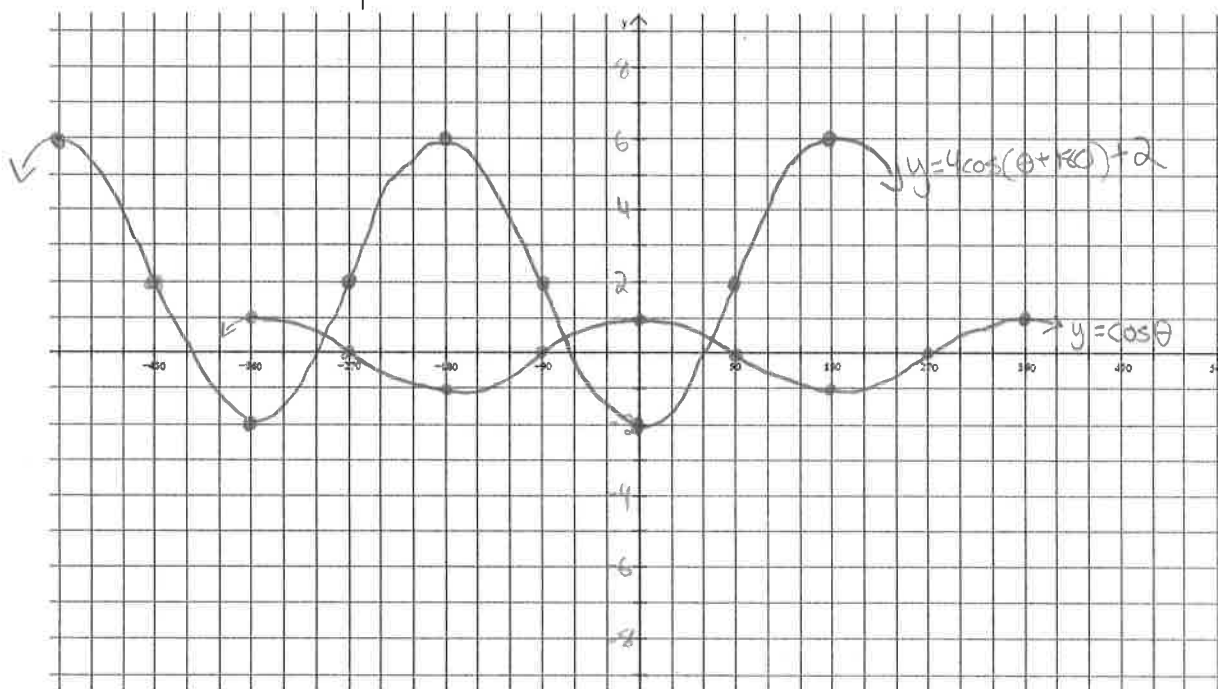
1) Using transformations, graph two cycles of the following trigonometric functions. State the period, phase shift, amplitude, and vertical displacement.

a)  $y = 4\cos(\theta + 180^\circ) + 2$

period = 360    amplitude = 4

left 180°

up 2



$y = \cos \theta$

$\theta$	$y$
0	1
90	0
180	-1
270	0
360	1

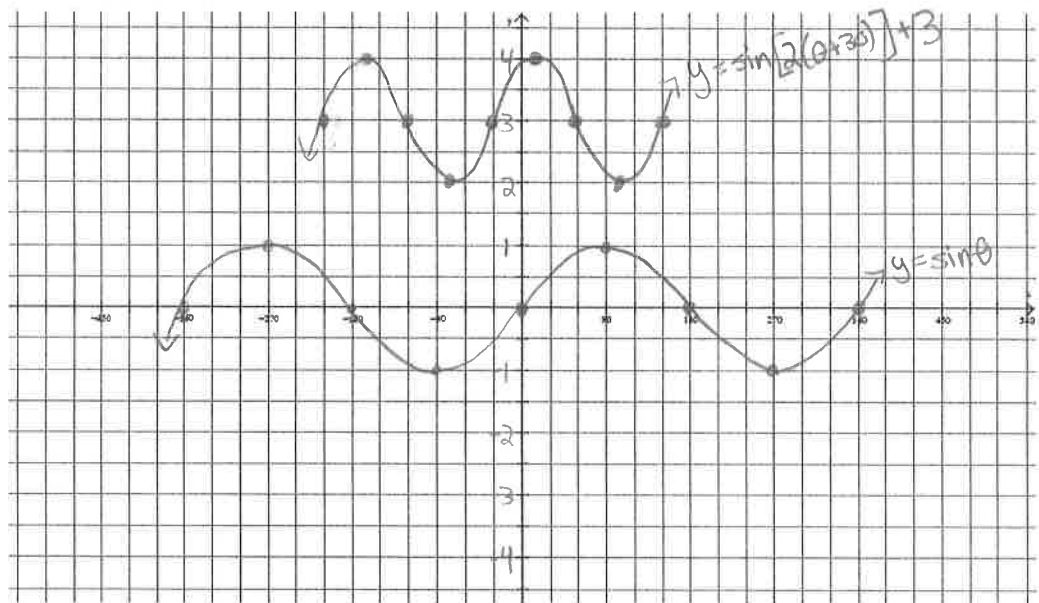
$y = 4\cos(\theta + 180) + 2$

$\theta - 180$	$4y + 2$
-180	6
-90	2
0	-2
90	2
180	6

b)  $y = \sin[2(\theta + 30^\circ)] + 3$

amplitude = 1  
 period =  $\frac{360}{2}$   
 = 180

left  $30^\circ$   
 up 3



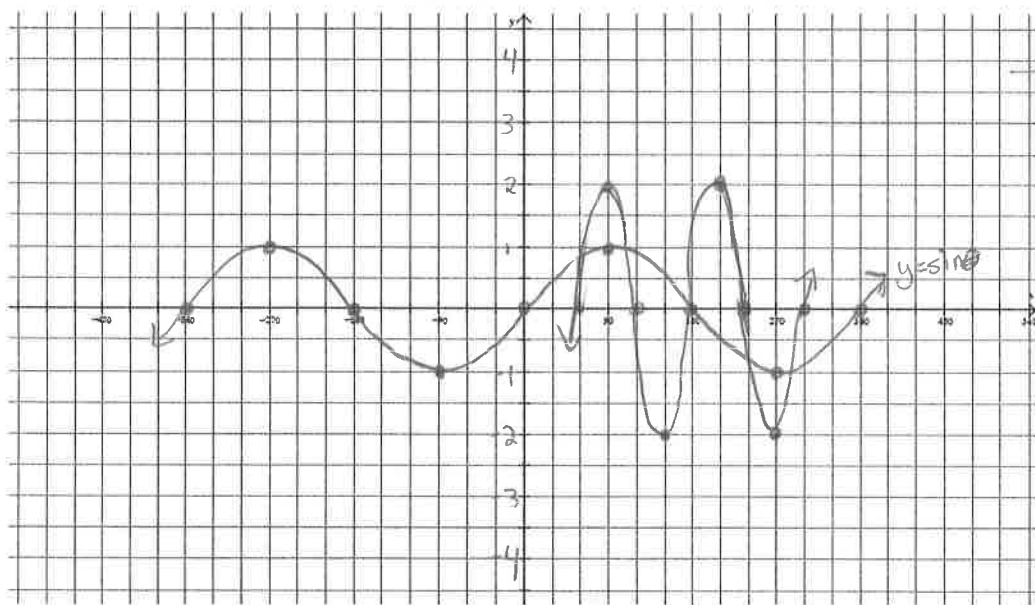
$\theta$	y
0	0
90	1
180	0
270	-1
360	0

$\frac{\theta}{2} - 30$	y+3
-30	3
15	4
60	3
105	2
150	3

c)  $y = 2\sin[3(\theta - 180^\circ)]$

amplitude = 2  
 period =  $\frac{360}{3}$   
 = 120

right  $180^\circ$



$\theta$	y
0	0
90	1
180	0
270	-1
360	0

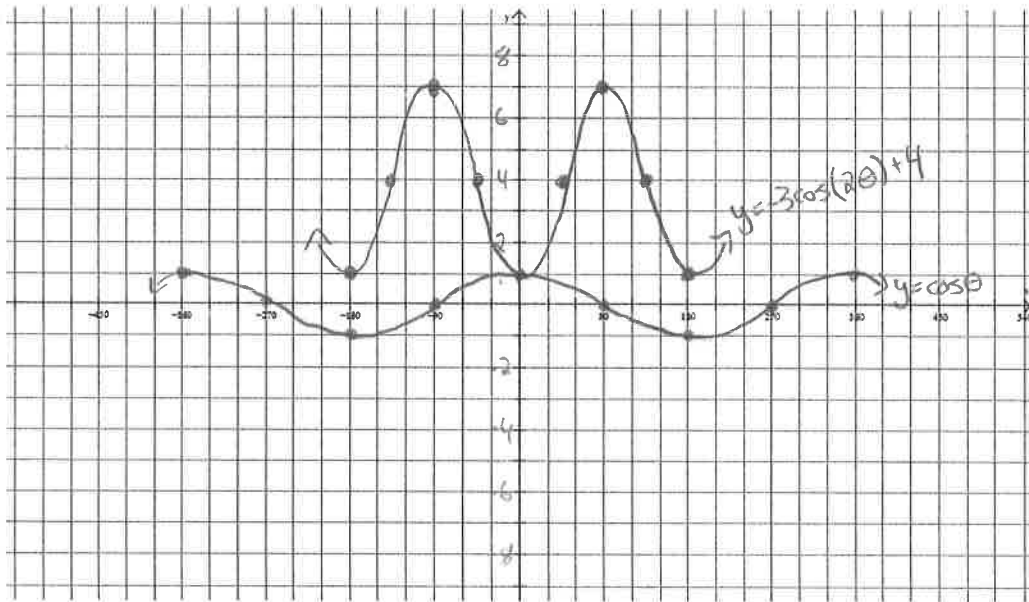
$\frac{\theta}{3} + 180$	2y
180	0
210	2
240	0
270	-2
300	0
330	-2
360	0

d)  $y = -3\cos(2\theta) + 4$

amplitude = 3

up 4

period =  $\frac{360}{2}$   
= 180°



$y = \cos \theta$

$\theta$	y
0	1
90	0
180	-1
270	0
360	1

$y = -3\cos(2\theta) + 4$

$\frac{\theta}{2}$	$-3y + 4$
0	1
45	4
90	7
135	4
180	1

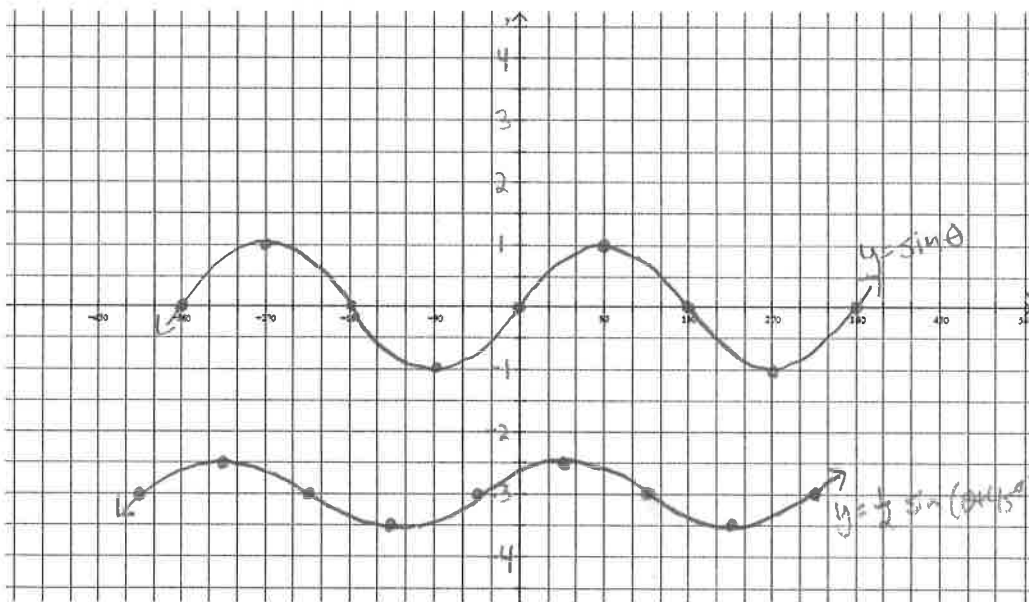
e)  $y = \frac{1}{2}\sin(\theta + 45^\circ) - 3$

amplitude =  $\frac{1}{2}$

left 45°

period = 360

down 3



$y = \sin \theta$

$\theta$	y
0	0
90	1
180	0
270	-1
360	0

$y = \frac{1}{2}\sin(\theta + 45^\circ) - 3$

$\theta - 45^\circ$	$\frac{y}{2} - 3$
-45	-3
45	-2.5
135	-3
225	-3.5
315	-3

f)  $y = 3\cos[2(\theta - 60^\circ)] + 4$

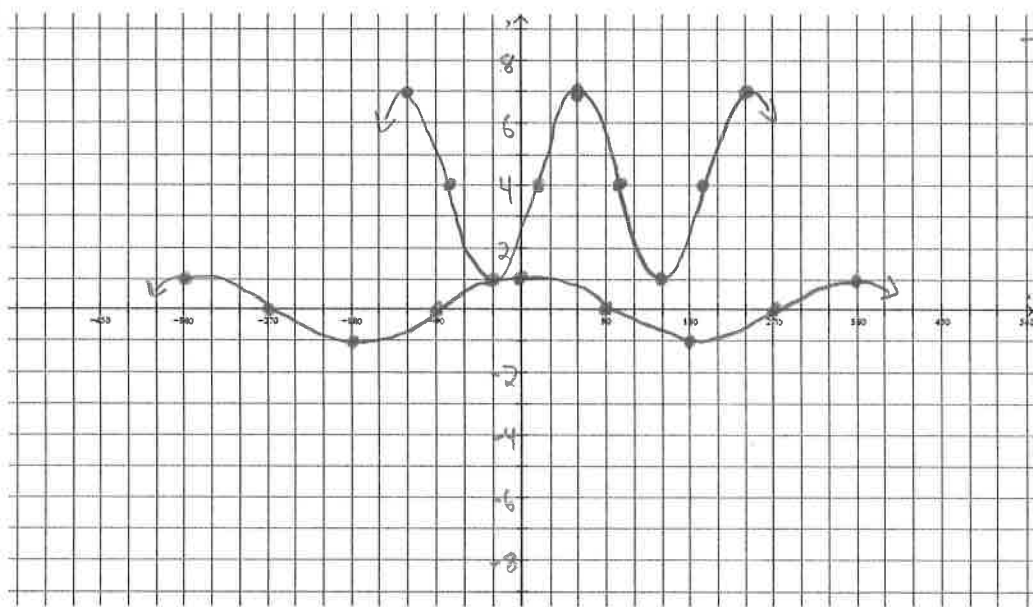
amplitude = 3  
 period =  $\frac{360}{2}$   
 = 180°  
 right 60°  
 up 4

$y = \cos \theta$

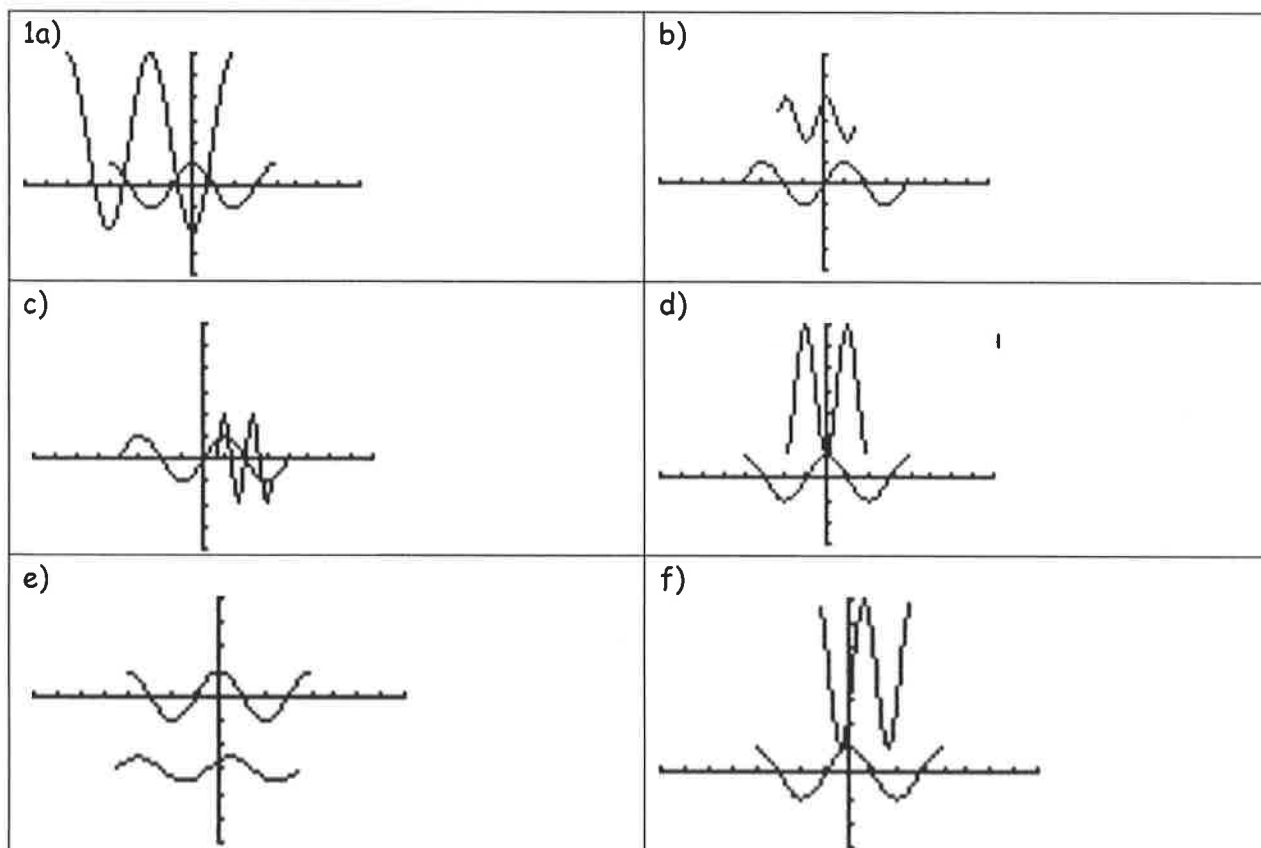
$y = 3\cos[2(\theta - 60^\circ)] + 4$

$\theta$	$y$
0	1
90	0
180	-1
270	0
360	1

$\frac{\theta}{2} + 60$	$3y + 4$
60	7
105	4
150	1
195	4
240	7



Answers



**a)** period =  $360^\circ$   
phase shift = left  $180^\circ$   
amplitude = 4  
vertical shift = up 2

**b)** period =  $180^\circ$   
phase shift = left  $30^\circ$   
amplitude = 1  
vertical shift = up 3

**c)** period =  $120^\circ$   
phase shift = right  $180^\circ$   
amplitude = 2  
vertical shift = none

**d)** period =  $180^\circ$   
phase shift = none  
amplitude = 3  
vertical shift = up 4

**e)** period =  $360^\circ$   
phase shift = left  $45^\circ$   
amplitude =  $\frac{1}{2}$   
vertical shift = down 3

**f)** period =  $180^\circ$   
phase shift = right  $60^\circ$   
amplitude = 3  
vertical shift = up 4