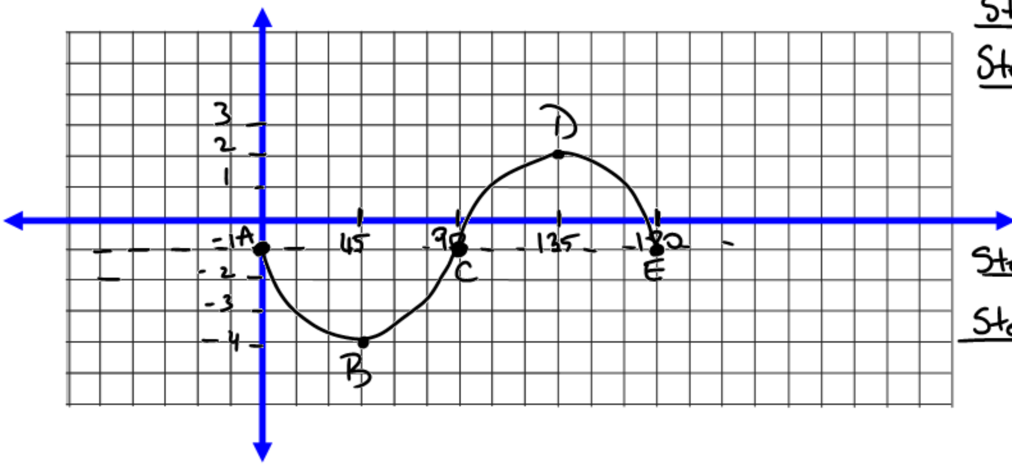
Unit 6 Review Trigonometric Functions

1. Sketch the graph of a sinusoidal function that has a period of 180, an amplitude of 3, and whose equation of the axis is y = -1.



Step 1: Draw y=-1

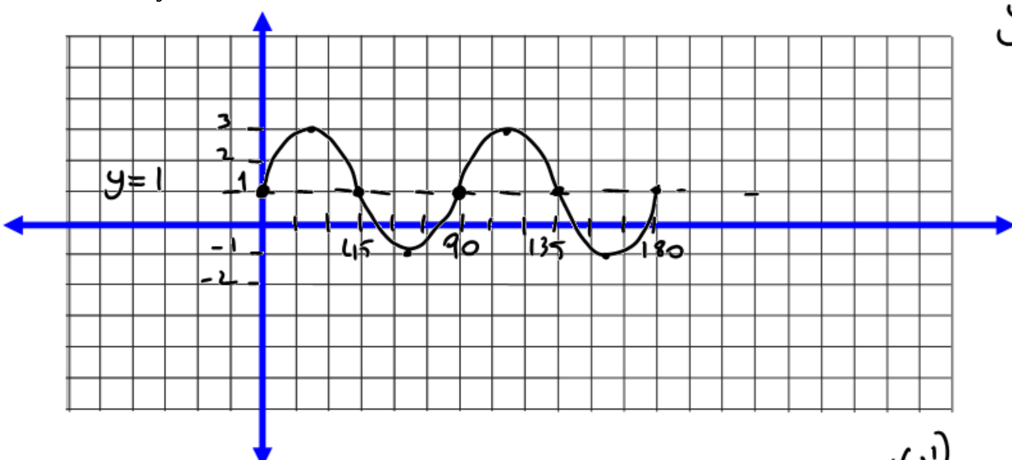
Step 2: Plot the A and E on y=-1. These points signify where wave starts and ends.

Step 3: Plot "C". It's halfway.

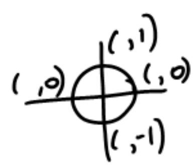
Step 4: Plot "B" and "D" they're also midpoints.

2. Sketch 2 cycles of the graph of a sinusoidal function that has a period of 90, an amplitude of 2, and whose equation of the axis is y = 1.

y = 1



3. For the function $m(x) = \sin(\frac{x}{2}) + 2$ → (x, y)



$(x,y) \rightarrow (2x, y+2)$

$(0,0) \rightarrow (0,2)$

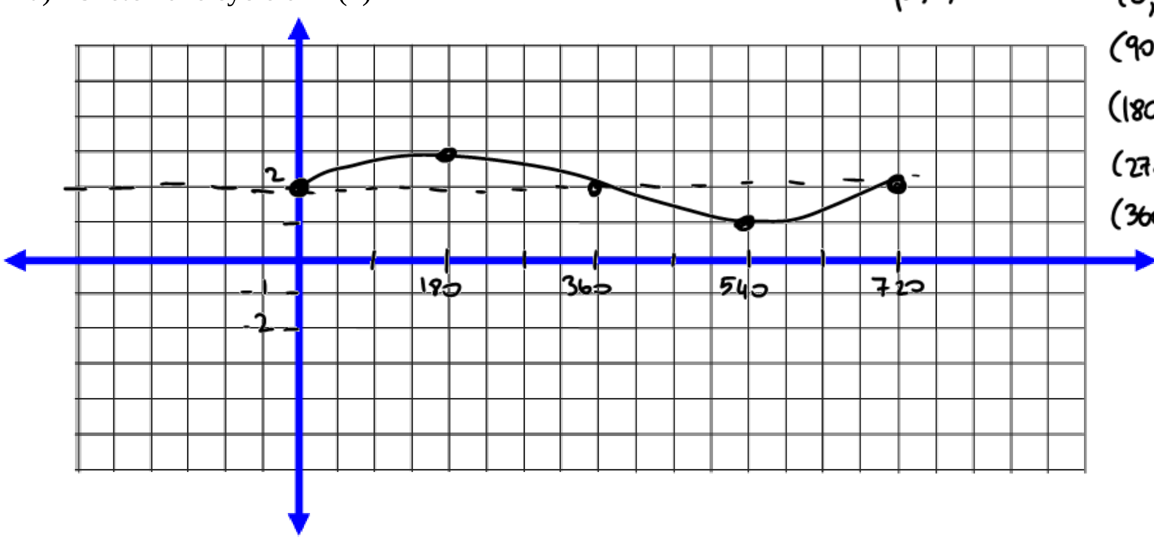
$(90,1) \rightarrow (180,3)$

$(180,0) \rightarrow (360,2)$

$(270,-1) \rightarrow (540,1)$

$(360,0) \rightarrow (720,2)$

a) Sketch one cycle of m(x)

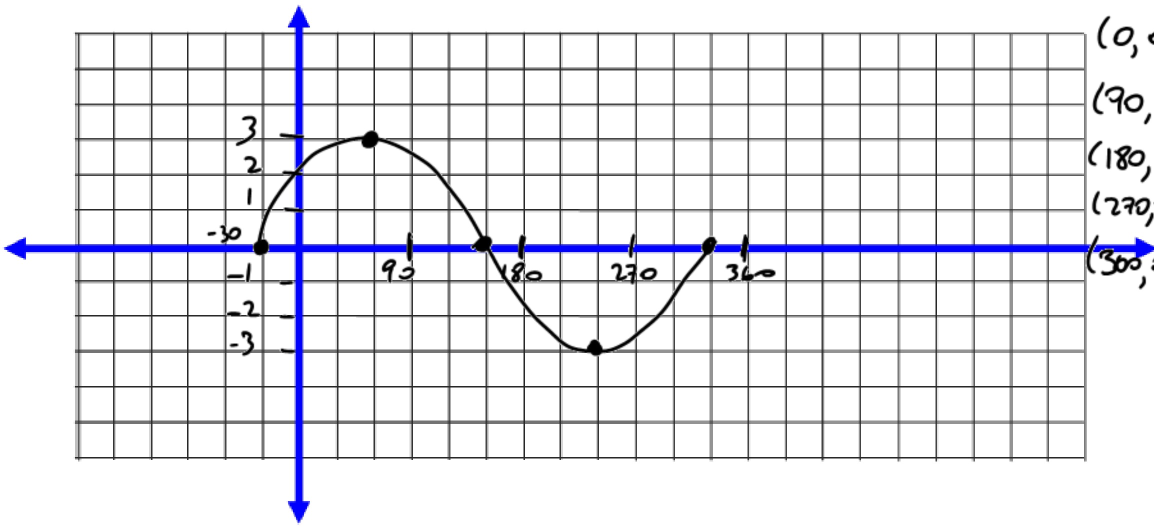


b) Complete the table for the function m(x).

Period	Amplitude	Equation of the Axis	Domain of 1 Cycle	Range
720	1	y = 2	$\{x \in R \mid 0 \le x \le 720\}$	$\{y \in R \mid 1 \le y \le 3\}$

4. For the function $f(x) = 3\sin(x + 30)$:
   a) Sketch one cycle of f(x)

$(x, y) \to (x - 30, 3y)$
$(0, 0) \to (-30, 0)$
$(90, 1) \to (60, 3)$
$(180, 0) \to (150, 0)$
$(270, -1) \to (240, -3)$
$(360, 0) \to (330, 0)$

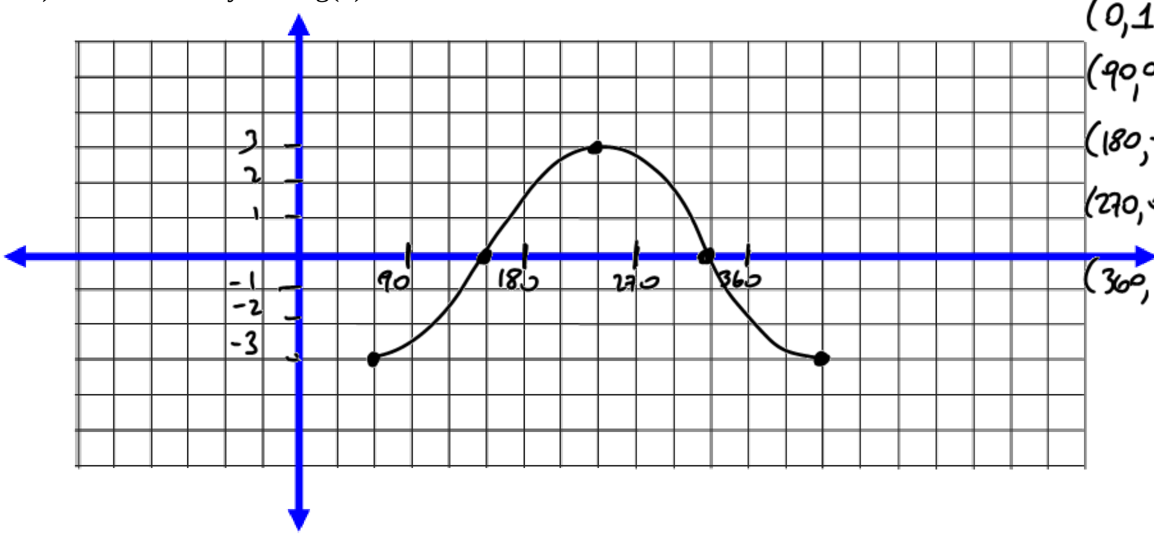


b) Complete the table for the function f(x).

Period	Amplitude	Phase Shift	Domain of 1 Cycle	Range
360	3	30° left	$\{x \in R \mid -30 \leq x \leq 330\}$	$\{y \in R \mid -3 \leq y \leq 3\}$

5. For the function $g(x) = -3\cos(x - 60)$:
   a) Sketch one cycle of g(x)

$(x, y) \to (x + 60, -3y)$
$(0, 1) \to (60, -3)$
$(90, 0) \to (150, 0)$
$(180, -1) \to (240, 3)$
$(270, 0) \to (330, 0)$
$(360, 1) \to (420, -3)$



b) Complete the table for the function g(x).

Period	Amplitude	Phase Shift	Domain of 1 Cycle	Range
360	3	60° right	$\{x \in R \mid -60 \leq x \leq 420\}$	$\{y \in R \mid -3 \leq y \leq 3\}$

6. Fill in the blanks: When y = sin x transforms to y = 2sin x, the y coordinate changes, while the x coordinate does not change.

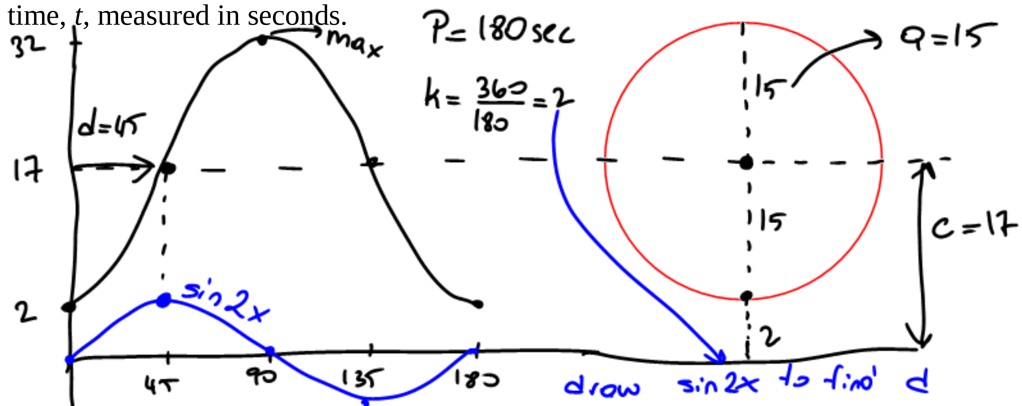
7. A Ferris wheel has a diameter of 30 metres, and the loading platform is 2 metres above the ground. The Ferris wheel completes one revolution every 180 seconds. Create a sinusoidal equation modeling the height, *h(t)*, of the rider above the ground, in metres, as a function of time, *t*, measured in seconds.

$y = a\sin[k(x-d)]+c$

$y = 15\sin[2(x-45)]+17$

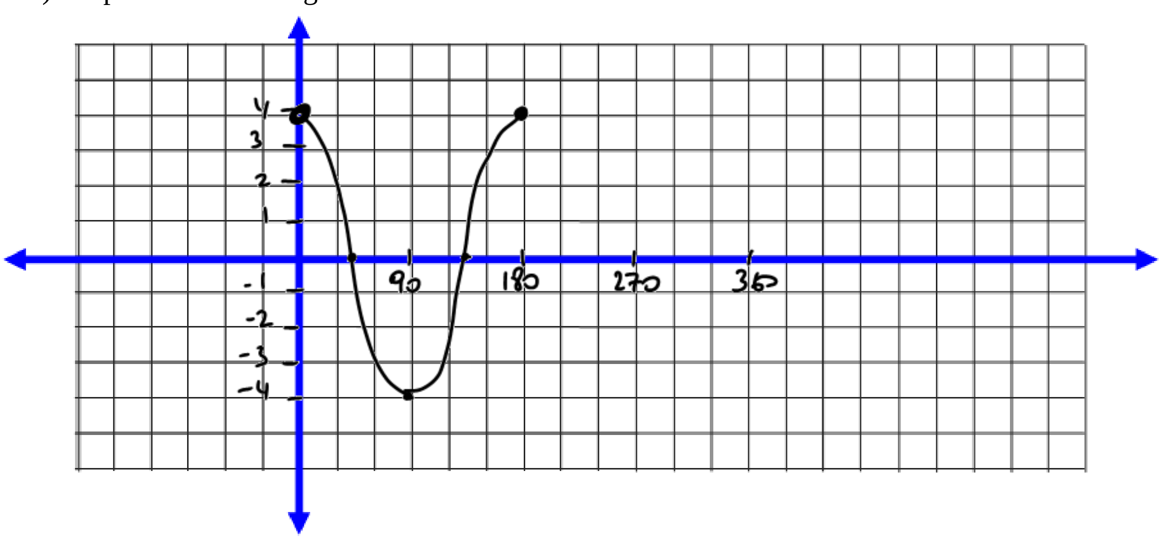
OR

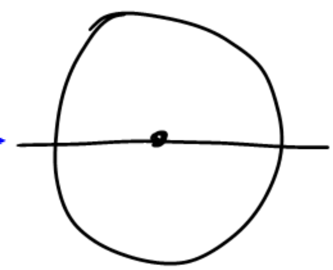
$y = 15\cos[2(x-90)]+17$



8. A snail is riding a water wheel as it turns counter clockwise, and her height above the water is given by the equation *h(t)* = 4cos(2*t*), where *h(t)* is in metres, and *t* is the time, in seconds.

   a) Graph the snail's height above the water as a function of time





b) What is the minimum height of the snail? What does this represent?

$y=-4$m. It's under water, 4m in depth.

c) Calculate the time required for one revolution of the water wheel.

180sec.

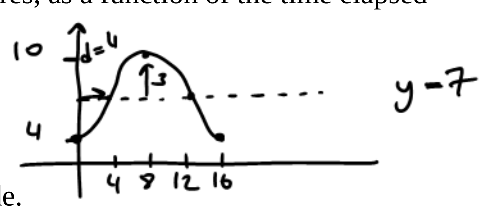
9. At low tide, the water is 4 metres deep. At high tide, the water is 10 metres deep. Each cycle takes 16 hours. Assume the cycle starts at low tide.

   a) Create a sinusoidal equation modeling the depth of the water, *d(t)*, in metres, as a function of the time elapsed since low tide, *t*, in hours.

$d(t) = 3\sin[22.5(t-4)]+7$

$d(t) = 3\cos[22.5(t-8)]+7$

$k = \frac{360}{16} = 22.5$



   b) Use the equation to calculate the depth of the water 42 hours after low tide.

$d(42) = 3\sin[22.5(42-4)]+7$

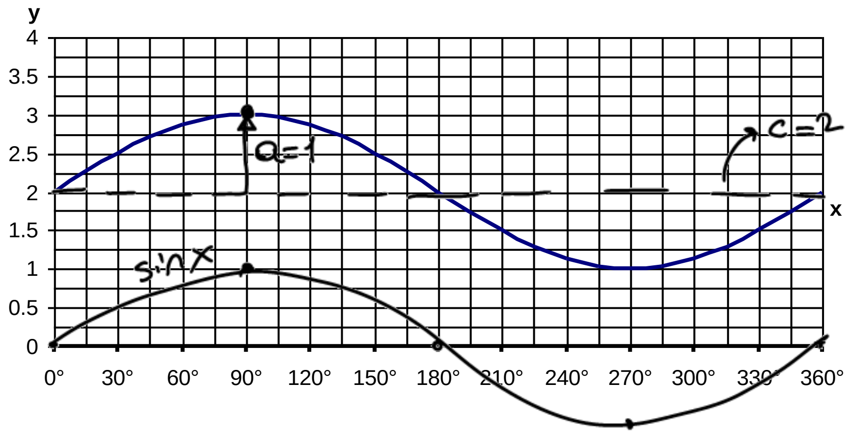
$= 3\sin[855]+7$

$= 9.1$

∴ It'll be approximately 9.1m.

10. State two possible sinusoidal equations of the function graphed on the grid below (1 sine, 1 cosine).

$a=1$, $c=2$, $d=0$ (sin), $k=1$



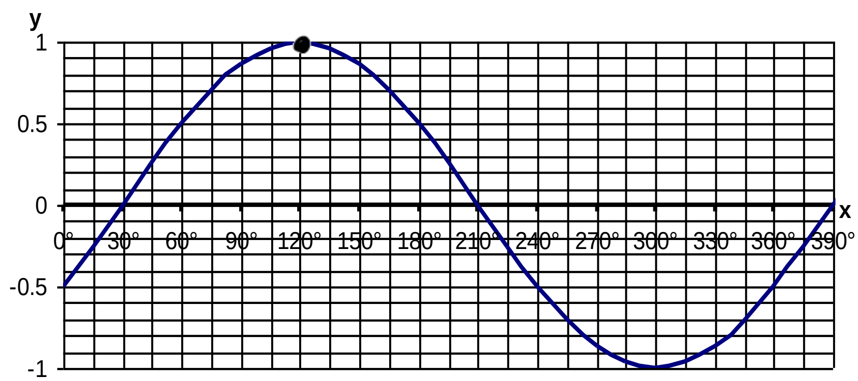
$y = \sin x + 2$

$y = \cos(x-90) + 2$

$y = 3\sin\theta$

or

$y = 3\cos(\theta - 90)$



$y = \sin(\theta - 30)$

$y = \cos(\theta - 120)$

11. State the transformations (in order) that would be applied to the graph of f(x) = sin x to obtain the graph of g(x) = 3sin[2(x-45)].

- R → none
- S → vertically stretched by a factor of 3 and horizontally compressed by a factor of ½
- T → Shifted 45° right

12. State the transformations (in order) that would be applied to the graph of f(x) = cos x to obtain the graph of $h(x) = \sin(2x - 180) + 3$

$= \sin[2(x-90)] + 3$

R – none

S – horizontally compressed by a factor of ½

T – shifted 90° right and 3 units up.