Pre-Calculus 12
6.7 – Applications of Sinusoidal Functions

Name:_____
Block: _____

In lessons 6.4-6.6, the scale on the horizontal axis of a sinusoidal graph was in terms of π. When sinusoidal graphs are used in applications, the horizontal axis usually represents time, and the axis is labelled with whole numbers.

e.g. The period of $y=\sin 3x$ is $2\pi\left(\frac{1}{3}\right)=\frac{2\pi}{3}$

The period of $y=\sin\frac{2\pi}{3}x$ is $2\pi\left(\frac{3}{2\pi}\right)=3$

Ex. 1. Sketch the graph of $y=3\sin\pi(x-1)+2$.

Amplitude: 3

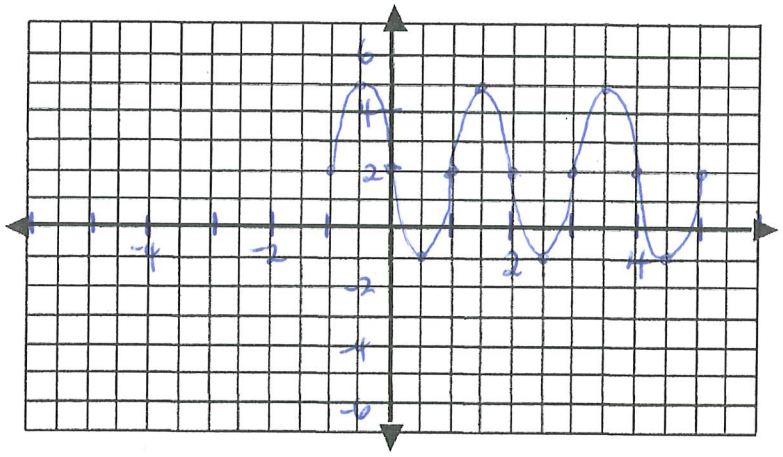
Centre line: 2

Maximum: 5

Minimum: -1

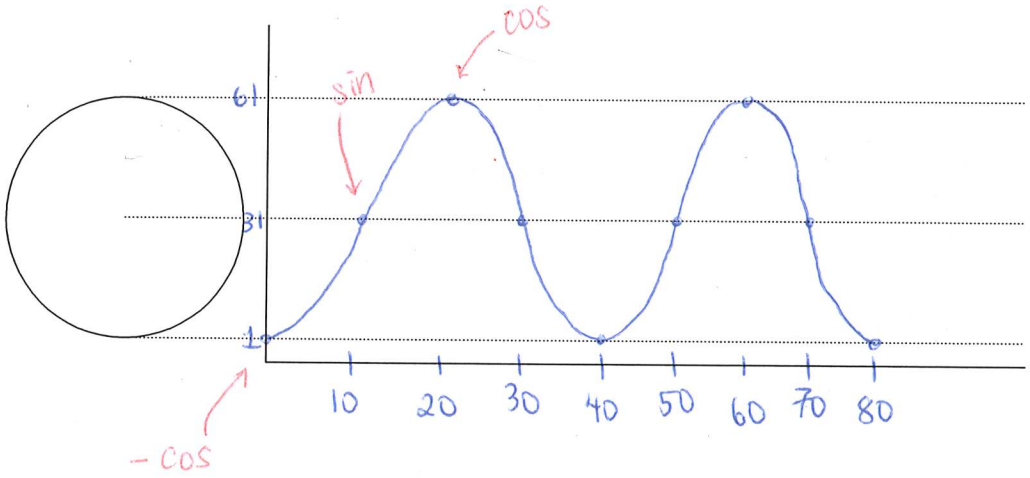
Period : $\frac{2\pi}{\pi}=2$

Phase Shift : right 1




Ex. 2. A Ferris wheel has a radius of 30m. Passengers get on at the lowest point of the wheel, which is 1m above the ground, at $t$=0. The wheel rotates once every 40s.

a) Sketch a graph to represent the height of a rider over the first 2 turns.



b) Write an equation to represent the height of a rider, $h$ metres, at time $t$ seconds.

amp = 30 m
centre = 31 m
period = 40 s
p.s. = depends on sin or cos!

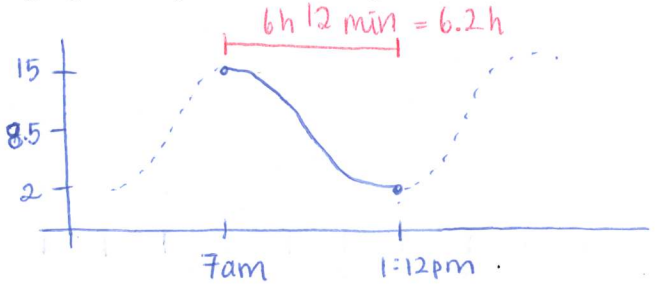
$h = 30 \cos \frac{2\pi}{40}(t-20) + 31$

$h = 30 \sin \frac{2\pi}{40}(t-10) + 31$

$h = -30 \cos \frac{2\pi}{40} t + 31$

Ex. 3. On a typical day at an ocean port, the water has a maximum depth of 15 m at 7:00am. The minimum depth of 2 m occurs at 1:12 pm. Assume that the relation between depth of water and time is a sinusoidal function.

a) Sketch a graph to represent the depth of water over the first 24 hours.




amp = 6.5 m
centre = 8.5 m
period = 6.2 × 2 = 12.4 hrs
p.s = 7 hours (cosine)
↑ starts at max

b) Write an equation to represent the depth of water, $h$ metres, at time $t$ hours.

$h = 6.5 \cos \frac{2\pi}{12.4}(t-7) + 8.5$

c) Determine the depth of the water at 10:00 am.

time = t

$h = 6.5 \cos \frac{2\pi}{12.4}(10-7) + 8.5$

$h = 6.5 \cos\left(\frac{2\pi}{12.4}(3)\right) + 8.5$

$h = 8.83 \text{ m}$

p. 548 # 3-9a, MC # 1, 2