Date: ____________________

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) solve problems related to real-world applications of sinusoidal functions.

"Show What You Know" 6.2 is Today

Last day's work: pp. 391-393 #1 – 6, 9, 12 [13,14]

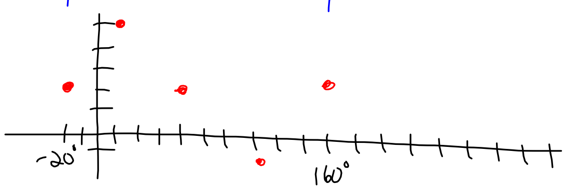
5d

p. 392 **5.** For each table of data, determine the equation of the function that is the simplest model.

d)

x	−20°	10°	40°	70°	100°	130°	160°
y	2	5	2	−1	2	5	2

180°



$a = \frac{5-(-1)}{2} = \frac{6}{2} = 3$

$c = \frac{5+(-1)}{2} = \frac{4}{2} = 2$

$d = -20$

$k = \frac{360°}{180°} = 2$

$*\text{period} = 160° - (-20°) = 180°$

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

$= 3\sin(2(x-(-20)))+2$

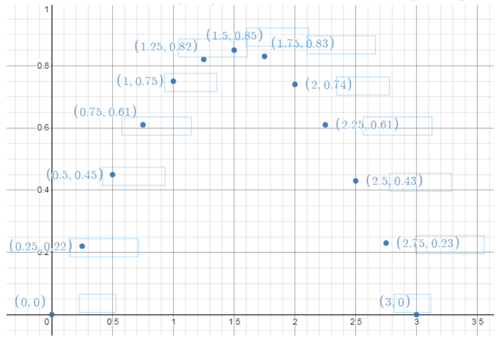
$= 3\sin(2(x+20))+2$

p. 393 **9.** The table shows the velocity of air of Nicole's breathing while she is at rest.

Time (s)	0	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2	2.25	2.5	2.75	3
Velocity (L/s)	0	0.22	0.45	0.61	0.75	0.82	0.85	0.83	0.74	0.61	0.43	0.23	0

a) Explain why breathing is an example of a periodic function.
b) Graph the data, and determine an equation that models the situation.
c) Using a graphing calculator, graph the data as a scatter plot. Enter your equation and graph. Comment on the closeness of fit between the scatter plot and the graph.
d) What is the velocity of Nicole's breathing at 6 s? Justify.
e) How many seconds have passed when the velocity is 0.5 L/s?

9. **a)** The respiratory cycle is an example of a periodic function because we inhale, rest, exhale, rest, inhale, and so on in a cyclical pattern.



max = 0.85
min = 0

$a = \frac{max - min}{2}$ $c = \frac{max + min}{2}$

$= \frac{0.85}{2}$ $= \frac{0.85}{2}$

$= 0.425$ $= 0.425$

Choose $d = 0$

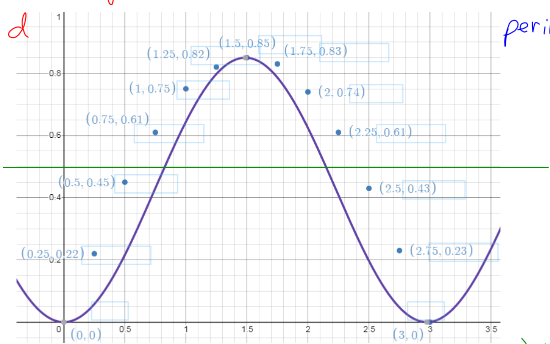
∴ cosine curve

reflection in x-axis (starts at bottom)

$\therefore a = -0.425$

$\therefore y = -0.425\cos(120x)^\circ + 0.425$

d



period = 3

$\therefore k = \frac{360}{3}$

$= 120$

part e) $y = 0.5$ L

d) if $x = 6$ s

$y = -0.425\cos(120(6)) + 0.425$

$= -0.425\cos 720^\circ + 0.425$

$= -0.425(1) + 0.425$

$= 0$ * Also double 3 sec (which was 0)

e) if $y = 0.5$ L, find x

$0.5 = -0.425\cos(120x) + 0.425$

$0.5 - 0.425 = -0.425\cos 120x$

$0.075 = -0.425\cos 120x$

$\frac{0.075}{-0.425} = \cos 120x$

Let $W = 120x$

$\cos W = \frac{0.075}{-0.425}$

$\doteq -0.1764$

$W \doteq \cos^{-1}(-0.1764)$

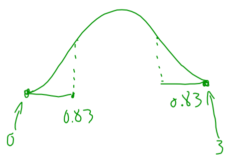
$\doteq 100.16$

But $W = 120x$

$\therefore 100.16 \doteq 120x$

$x \doteq 0.83$, Also $x \doteq 3 - 0.83$

$\doteq 2.17$ s



p. 393 **12.** Describe a procedure for writing the equation of a sinusoidal function based on a given graph.

Find max & min values (of y)

$a = \frac{max - min}{2}$ $c = \frac{max + min}{2}$

Find the period for 1 cycle (in the x-direction)

$k = \frac{360°}{period}$

Choose a starting point "d", either on the equation of the axis (a sin curve), or at a max or min value (a cos curve)

↳ if down from eqn of axis, then reflected, ∴ a = -ve.

↳ If choose min value, then reflected in x-axis ∴ a = -ve

p. 393

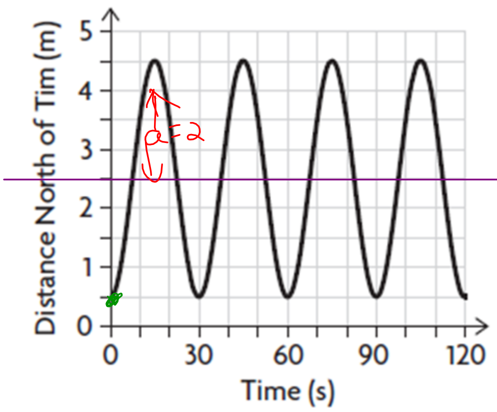
Extending

13. The diameter of a car's tire is 60 cm. While the car is being driven, the tire picks up a nail. How high above the ground is the nail after the car has travelled 1 km?

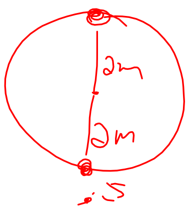
6.7 Solving Problems Using Sinusoidal Models

Date: May 22/19

Ex. 1 Tim has a model train that goes around a circular train track, and Tim is standing directly south of the track.
The graph below shows the train's distance north of Tim as a function of time.



$y = 2.5$
$\hookrightarrow = c$



$k = \frac{360°}{\text{period}}$

$= \frac{360°}{30}$

$= 12$

$y = -2\cos(12t) + 2.5$

a) What is the equation of the axis of the function? $y = 2.5$

b) What is the amplitude of the function, and what does it represent in this situation?? a = 2; the radius of the track

c) What is the period of the function, and what does it represent in this situation?? 30 s; time for 1 lap around the track

d) What is the range of the function? $\{y \quad \mathbf{R} / 0.5 \le y \le 4.5\}$

e) Determine ~~the~~ an equation of the sinusoidal function. $y = -2\cos(12x) + 2.5$

f) What is the train's distance north of Tim at $t = 52$ s?

Sub $t = 52$ s in equation above, then $y = 2.709$ m

Ex. 2

A Ferris wheel with radius 20 metres rotates once every 40 seconds.
Passengers get on at the bottom of the wheel, which is 1 metre off the ground.
Suppose you get on, and the wheel starts to rotate.

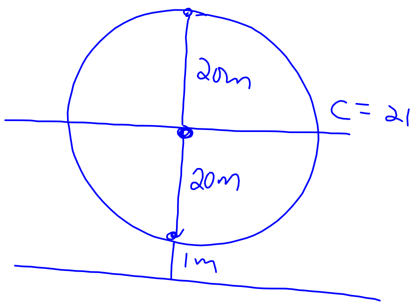
a) Write a sinusoidal equation which expresses your height as a function of elapsed time.

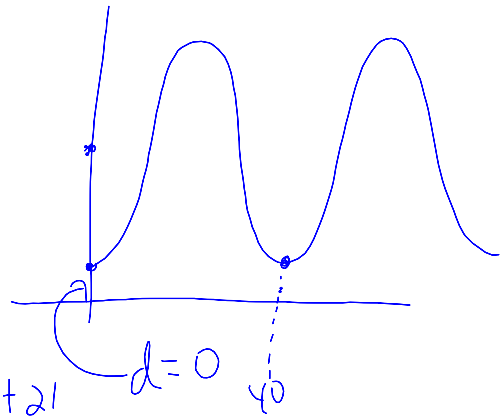
$a = 20$

period = 40 sec

$c = 21$

$k = \frac{360}{40}$
$= 9$





$h(t) = -20\cos(9t) + 21$

or $= -20\cos(9(t-40)) + 21$

b) Calculate your height after 15 seconds.

35.14 m

$h(15) = -20\cos(9(15)+21)$
$= -20\cos(135)+21$
$\doteq 35.14$

c) If you are on the Ferris wheel for 5 minutes, how many complete rotations will you have completed?

$5\text{ min} \times \frac{60\text{ sec}}{\text{min}} = 300\text{ sec}$

$\#\text{rotations} = \frac{300}{40}$
$= 7.5$

(7.5)
7 **complete** rotations

Today's Homework Practice includes:
pp. 398-401 #1 – 4, 6, 7, 9 [13]

Tomorrow's Review:
pp. 404-405 #1 – 3, 6, 8 – 10, 12, 13