Unit 3 Review
PreCalculus 2016

Name_____
Period_____ Date _____

Make sure you also look over your notes, quiz, and homeworks! The more work you show for each problem, the more credit you will receive.

RADIANS

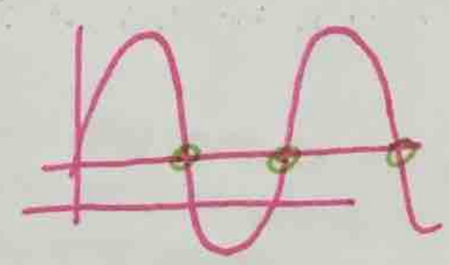
For each of the following functions use a graphing calculator to:
a) Find $f(x)$ for the given value of x TRACE X=#
b) Find the first three positive values of x for the given value of $f(x)$ Y_1 = eqn (WINDOW) Y_2 = # 2nd TRACE 5:intersect
Round to three decimal places. Show your work by sketching the graph from your calculator!

$\boxed{f(x)=Y}$

1. $f(x)=3+5\cos\left(\frac{\pi}{12}(x-7)\right)$

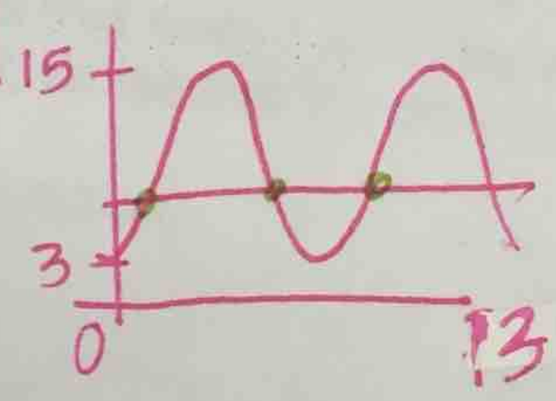
a.) Find $f(8.3)$
X=8.3 $\boxed{7.713}$
b.) $f(x)=1$
Y=1
$\boxed{14.572,\ 23.428,\ 38.572}$

WINDOW
Xmin: 0
Xmax: 48
Ymin: -2
Ymax: 8



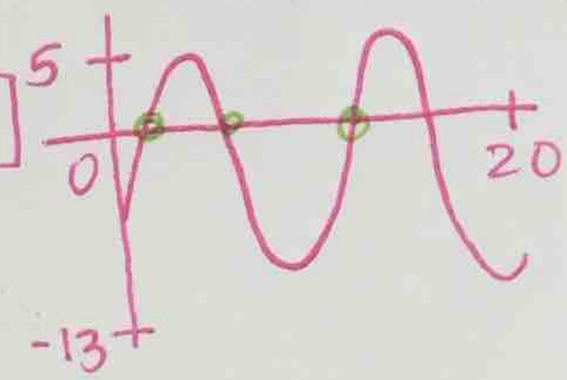
2. $y=9+6\sin\left(\frac{\pi}{3}(x+5)\right)$

a.) Find $f(12.7)$
X=12.7 $\boxed{7.146}$
b.) $f(x)=6$
Y=6
$\boxed{0.5,\ 4.5,\ 6.5}$



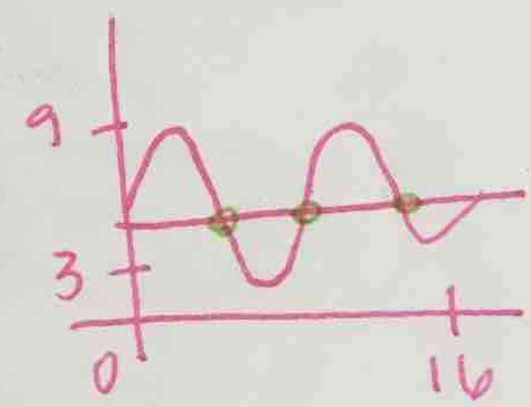
3. $y=-4+9\sin\left(\frac{\pi}{5}(x-.7)\right)$

a.) Find $f(2.8)$
X=2.8 $\boxed{4.717}$
b.) $f(x)=0$
Y=0
$\boxed{1.433,\ 4.967,\ 11.433}$



4. $y=6+3\cos\left(\frac{\pi}{4}(x+6.1)\right)$

a.) Find $f(5)$
X=5 $\boxed{3.719}$
b.) $f(x)=5.5$
Y=5.5
$\boxed{4.113,\ 7.687,\ 12.113}$



5. The general form of a sinusoidal equation is $y=C+A\,\text{trig}\,B(x-D)$.

What do each of A, B, C, and D represent?

A → Amplitude (distance from mid to top)
B → period = $\frac{2\pi}{B}$ OR $\frac{360}{B}$
C → Sinusoidal Axis (mid line)
D → starting point
sin → middle cos → top

What might each piece represent in a real world problem?

A → distance
B → cycle
C → average distance
resting rate
D → highest or lowest

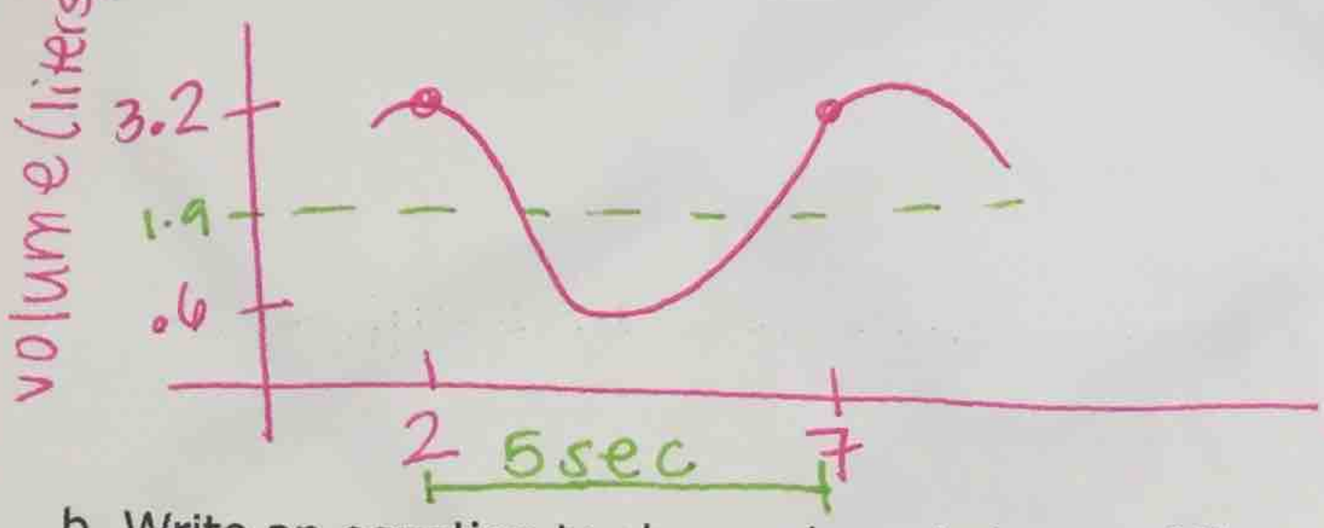
x → time y → volume of air

6. Assume that as you breathe, the volume of air in your lungs is a sinusoidal function of time. Suppose that at time t = 2 seconds, your lungs have their maximum volume of 3.2 liters. When you exhale, your lungs still have .6 liters. Your breathing rate is one complete breath every 5 seconds.

↑smallest

(inhale/exhale → 1 cycle)

a. Draw a graph to show volume of air vs time



A: $\frac{3.2-0.6}{2} = 1.3$

C: $3.2 - 1.3 = 1.9$

B: $\frac{2\pi}{\text{period}} = \frac{2\pi}{5}$

D: cos 2

b. Write an equation to show volume in terms of time

$y = 1.9 + 1.3\cos\left(\frac{2\pi}{5}(x-2)\right)$

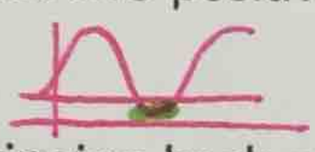
CALC

c. How much air did you have in your lungs at time t = 0?

x=0 0.848 liters

d. Between what two positive values of t did your lungs first have no more than 1 liter of air?

y=1



intersections 3.859, 5.141

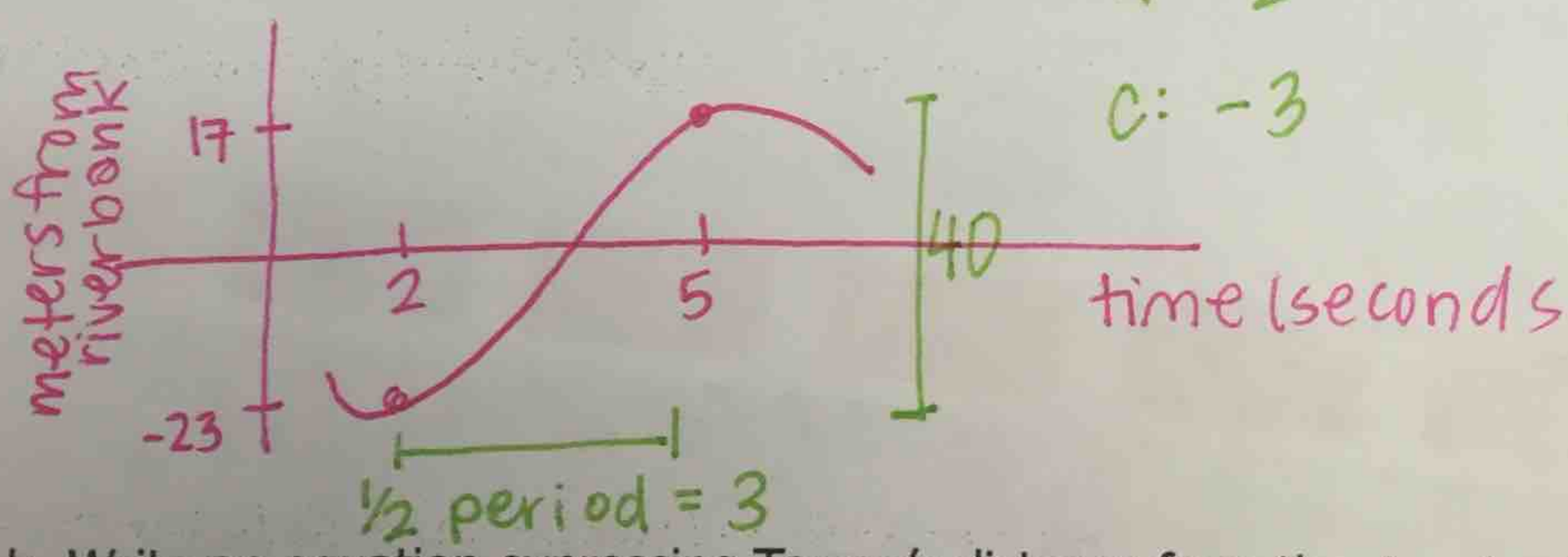
between 3.859 and 5.141 seconds

7. Tarzan is swinging back and forth on his grapevine. As he swings, he goes back and forth across the riverbank, going alternately over land and water. Jane decides to model his movement mathematically and starts her stopwatch. Let t be the number of seconds the stopwatch reads and let y be the number of meters Tarzan is from the riverbank. Assume that y varies sinusoidally with t and that y is positive when Tarzan is over water and negative when he is over land. Jane finds that when t = 2, Tarzan is at the end of his swing, where y = -23. She finds that when t = 5, he reaches the other end of his swing and y = 17.

a. Sketch a graph of this function.

A: $\frac{40}{2} = 20$ B: $\frac{2\pi}{6} = \frac{\pi}{3}$

C: -3 D: cos 5 (high)



b. Write an equation expressing Tarzan's distance from the river bank in terms of t.

$y = -3 + 20\cos\left(\frac{\pi}{3}(x-5)\right)$

c. Find y when t = 2.8, t = 6.3 and t = 1.5

x = # -16.383, 1.158, -20.321

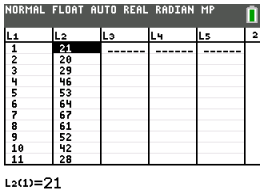
d. Where was Tarzan when Jane started her stopwatch?

x=0 7 meters over the water

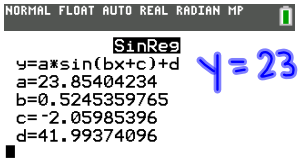
8. The average monthly temperatures for Moscow, Russia are shown below. Use a sinusoidal regression on your calculator to find an equation that models the data.

	L1 Month	L2 Average Temperature
1	January 2016	21
2	February 2016	20
3	March 2016	29
4	April 2016	46
5	May 2016	53
6	June 2016	64
7	July 2016	67
8	August 2016	61
9	September 2016	52
10	October 2016	42
11	November 2016	28
12	December 2016	20
13	January 2017	21
14	February 2017	20
15	March 2017	29
16	April 2017	46
17	May 2017	53
18	June 2017	64

STAT 1:Edit...



STAT ▸CALC c:SinReg

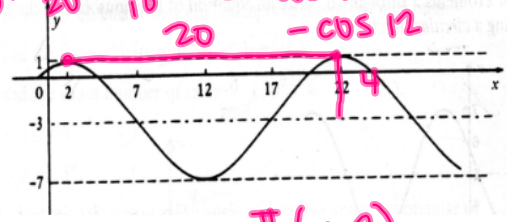


$y = 23.854\sin(0.525x - 2.060) + 41.994$

9. Write two different equations of the graph below using cosine in radians.

A: 4 B: $\frac{2\pi}{20} = \frac{\pi}{10}$ D: cos 2 or 22

C: −3 20 −cos 12



$y = -3 + 4\cos\frac{\pi}{10}(x-2)$

$y = -3 - 4\cos\frac{\pi}{10}(x-12)$

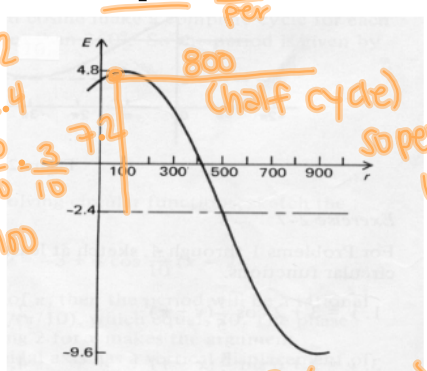
10. Write the equation of the graph below using cosine in degrees. $\frac{360}{per}$

A: 7.2 800 (half cycle)

C: −2.4 so period = 1600

B: $\frac{360}{1600} = \frac{3}{10}$

D: cos 100



$y = -2.4 + 7.2\cos\frac{3}{10}(x - 100)$

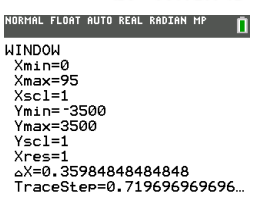
11. The distance from the equator to a space shuttle in orbit can be modeled with a sinusoidal function. The following equation represents the distance to the equator in km, y, as a function of the time elapsed, x, in minutes. Positive distances represent when the shuttle is north of the equator and negative distances represent when the shuttle is south of the equator.

$$y = 3500\cos\left(\frac{2\pi}{95}(x-5)\right)$$

a. What is the shuttle's distance from the equator at x = 67 minutes? Is the shuttle north or south of the equator at this time?

x = 67 −2010.15 km SOUTH

b. When is the shuttle 1,500 km south of the equator for the first time



$Y_2 = -1500$ 35.447 min