Pre-Calculus
Unit 2 Review

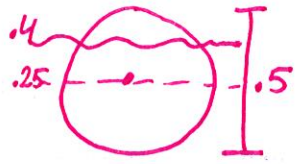
Name: Answer key
Date: _____ Period: _____

1. An ant gets stuck on your car tire tread and you drive through a creek that is 0.4 meters deep. If your tire is 0.5 meters tall, and rotates once every 0.8 seconds, how long will the ant have to hold its breath while riding on your tire?

$\frac{10\pi}{4} = \frac{5\pi}{2} = b$

$.6819 - .118 = .5639$

$A = .25$
$d = .25$
$b: \frac{\pi}{4}$



$y = .25\cos\left(\frac{\pi}{4}x\right) + .25$

From calculator: (.6819, .4) and (.118, .4)

2. At a seaport, the water has a maximum depth of 16 meters at 8:00 PM. After this maximum depth, the first minimum depth of 6 meters occurs at 2:00 AM. Assume the relationship between the water depth and time is a sinusoidal function.

a. Graph the relationship between time (hours) and water depth (meters). Give five specific points on your graph.

b. Write an equation that models this situation.

$A = 5$ $d = 11$ $b = \frac{2\pi}{12} = \frac{\pi}{6}$ $y = 5\cos\left(\frac{\pi}{6}x\right) + 11$ *$t = 0$ is 8P.M. (or $x = 0$)

c. What is the water depth at 9:30 AM?

$x = 13.5$ Plug in for x: 14.5m

d. At what time will the water depth first be at 12 feet?

*From calculator, intersect is: (2.615, 12) So, 2.61 hours after 8pm.

e. How long will the water depth be below 8 feet?

$\frac{61}{100} = \frac{x}{60} \approx 37$ mins

(4.23, 8) and (7.77, 8)

10:37 P.M.

$7.77 - 4.23 = 3.54$ hours

~3 hours 32 mins.

3. On a particular Labor Day, the high tide in Southern California occurs at 7:12 AM. At that time you measure the water at the end of the Santa Monica Pier to be 11 feet deep. At 1:24 PM it is low tide, and you measure the water to be only 7 feet deep. Assume the depth of the water is a sinusoidal function of time with a period of $\frac{1}{2}$ a lunar day, which is about 12 hours 24 minutes.

$b = \frac{2\pi}{12.4} = \frac{\pi}{6.2} = \frac{5\pi}{31}$

a. At what time on that Labor Day does the first low tide occur?

Trick question... 1 AM!

* 6 hours and 12 mins earlier than 7:12 A.M.

b. What was the approximate depth of the water at 4:00 AM and at 9:00 PM?

$y = 2\cos\left(\frac{5\pi}{31}x\right) + 9$ $t=0$ is 7:12 A.M

(-3.2) $= 8.9$ ft.

(13.8) $= 10.52$ ft.

c. What is the first time on that Labor Day that the water is 9 feet deep?

*From calculator: (-3.1, 9)

.1 = 6 mins 4:06 AM.

if using $t=0$ is midnight:

$y = 2\cos\left(\frac{5\pi}{31}(t-7.2)\right) + 9$

in calculator: (4.1, 9) is still 4:06 A.M.

4. The diameter of a Ferris wheel is 150 feet, and one complete revolution takes 8 minutes. The bottom of the wheel is 10 feet above the ground.

a. Determine an equation that will give a passenger's height above the ground at any time during the ride if the passenger gets on the ride at the bottom of the wheel.

$A = 75$ $b = \frac{2\pi}{8} = \frac{\pi}{4}$ $y = -75\cos\left(\frac{\pi}{4}x\right) + 85$

$d = 85$

b. Determine an equation that will give a passenger's height above the ground at any time during the ride if the passenger gets on the ride halfway between the bottom and the top of the wheel and rises.

$y = 75\sin\left(\frac{\pi}{4}x\right) + 85$

c. Graph the equation from part b.