Practice

1) The height of the tide at a dock can be modeled by the equation

$$h = 4.5\sin(0.5t - 1.5) + 7.3$$

where h is the height of the tide in meters at time t (using a 24 hour clock)

a) What is the maximum height of the tide? 11.8m
b) What is the minimum height of the tide? 2.8 m
c) What is the median height of the tide? 7.3 m
d) What is the period of this function? 4π
e) What is the height of the tide at a) 8:00 am b) 4 pm
10m 8.27m

2) In a seaport, the function $d(t) = 2.6\sin 0.25(t-5)+3.3$ can be used to estimate the depth of water, d meters, at time t hours after midnight. Estimate the number of hours in the 24-hour interval starting at $t = 0$ when the depth is at least 3.5m

5.3 and 17.26 $17.26 - 5.3 = 11.95$

3) At seaport, the water has a maximum depth of 18m at 3:00am. After this maximum depth, the first minimum depth of 4m occurs at 9:30am. Assume that the relation between the depth , h meters, and the time t hours, is a sinusoidal function. Determine an equation for h at any time t.

$y = 7\cos(\frac{2\pi}{13}x) + 11$ or $y = 7\cos\left(\frac{2\pi}{13}(x-3)\right) + 11$

$t=0$ is 3:00am $t=0$ is midnight

4) A wheel with diameter 10cm is rolling along the ground. Point P is on the edge of the wheel on the ground at time $t = 0$ seconds. Find an equation for the height of the point P above the ground at time t seconds, if the wheel rotates once every 12 seconds.

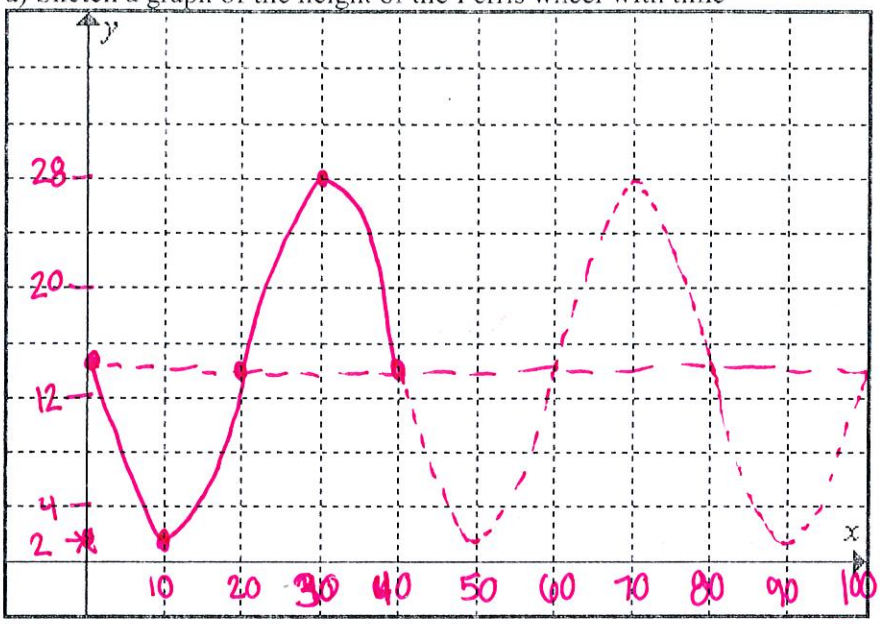
$y = -5\cos\left(\frac{\pi}{6}x\right) + 5$

5) Lenny and Carl get on a Ferris wheel half way between the bottom and the top of the Ferris wheel, which is located 14m above the ground and are rising when they start. They complete four revolutions lasting a total of 16mins. At the highest point on the ride, Lenny and Carl are 24m above the ground. Determine a sinusoidal function for this problem letting h represent their height in meters above the ground and t time in minutes.

$y = 10\sin\left(\frac{\pi}{2}x\right) + 14$

6) The radius of a Ferris wheel is 12 m, and the wheel rotates once every 40 seconds. A person sits 14 m above the ground and is falling when the wheel starts to rotate. The lowest height is 2 m above the ground.

a) Sketch a graph of the height of the Ferris wheel with time



b) Determine an equation for the height of the person at time t $y = -12\sin\left(\frac{\pi}{20}x\right) + 14$

c) How high is the person 25 seconds after the wheel starts turning? 22.5 m

d) What is the first time the person is 6 m above the ground? 4.65 seconds

7) A Ferris wheel has a radius of 10m and the maximum height the chair reaches is 22m. The wheel takes 90 seconds to complete one revolution and the rider starts at the bottom.

a) Sketch a graph that represents the height h in meters, of the bottom chair, as a function of time t, in seconds. Sketch one complete cycle.

b) Write an equation in terms of cosine, that expresses the height h of the bottom chair, as a function of time in seconds. That is $h = a\cos\left(b[x-c]\right) + d$.

$y = -10\cos\left(\frac{\pi}{45}x\right) + 12$

c) What is the lowest height that any chair is above the ground? 2m

d) Estimate the height the chair is above the ground after 20 seconds. 10.26

e) Estimate both times when the chair is 19m above the ground. ~~33~~ 33.6 and 56.39

8) The diameter of a Ferris wheel is 76 meters and the maximum height of the Ferris wheel is 80m. If the wheel rotates every 3 minutes and riders on a cart start at the lowest point,

a) Determine a sinusoidal equation to model the situation. $y = -38\cos\left(\frac{2\pi}{3}x\right) + 42$

b) How high is the cart 5 minutes after the wheel starts rotating 61m

c) How many seconds after the wheel starts rotating is the cart 50m above the ground for the first time? 51 seconds.

9) A Ferris wheel has a diameter of 30m, with the center 18m above the ground. It makes one revolution every 60s. If the rider gets on at the top,

a) Find a cosine equation to model this situation

b) What is the height of the rider at 52 seconds? 28.03

c) At what time(s) is the rider at 20m high? ~~288~~ 13.72 seconds 46.3 seconds.

10) A water wheel on a paddleboat has a radius of 1m. The wheel rotates once every 1.46 seconds and the bottom 0.3m of the wheel is submerged in the water.

a) Determine a sinusoidal equation, starting from a point at the top of the wheel $1.46 - 1.1 = .36$

$y = \cos\left(\frac{100\pi}{73}x\right) + 1$

b) How long is the point submerged? (2.37, .3) and (3.47, .3) $3.47 - 2.37 = 1.1$ sec

11) The average temperature for Regina is hottest at $27°C$ on July 12th, and coolest at $-16°C$ on January 10th (assume 29 days in February).

a) Write a sinusoidal equation to model the temperature

$A = 21.5$ $D = 5.5$ $b = \frac{\pi}{183}$ start low 10th day of year $y = -21.5\cos\left(\frac{\pi}{183}(x-10)\right) + 5.5$

b) What is the expected average temperature for March 15th?

75th day $-3.9°C$

c) How many days will the average temperature be over $20°C$?

1st time: day 145 (144.616) 2nd time: day 241.38 Roughly 96 days if 241 − 145.

HW: MC – 2, 10, 20, 30, 39, 49, 70 WR – 7