Sine Applications Homework

1) The following table shows the number, in millions, of unemployed people in the labor force for 1984-1995.

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Unemp	8.539	8.312	8.237	7.425	6.701	6.528	7.047	8.628	9.613	8.940	7.996	7.404

a) Enter the data in your calculator and get a scatter plot, with x = 0 corresponding to 1980. Does the data appear to be periodic? somewhat

b) Find a sine equation that models the data. $y = 1.22 \sin(.81x - 2.22) + 7.77$

c) Do you think this model is likely to be accurate much beyond the year 1995? Why or why not?

No Not logical that unemployment is sinusoidal

d) What is the period of the function? $\frac{2\pi}{.81} = 7.76$ yrs

e) What is the average number of unemployed people and what part of the model did you use to find it?

$d = 7.77$

2) The table shows the average monthly precipitation in inches, in San Francisco, CA, based on data from 1961 to 1990.

Month	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Precipitation	4.4	3.2	3.1	1.4	0.2	0.1	0	0.1	0.2	1.2	2.9	3.1

a) Make a scatter plot of the data in your calculator. Does the data appear to be periodic?

yes

b) Use the sine regression feature on a calculator to find a sinusoidal model for the data.

$y = 2.51 \sin(.41x + 1.78) + 2.26$

c) What is the period of the function?

$\frac{2\pi}{.41} = 15.32$

d) By how much does the precipitation vary in this period?

Actual $4.4 - 0 = 4.4$

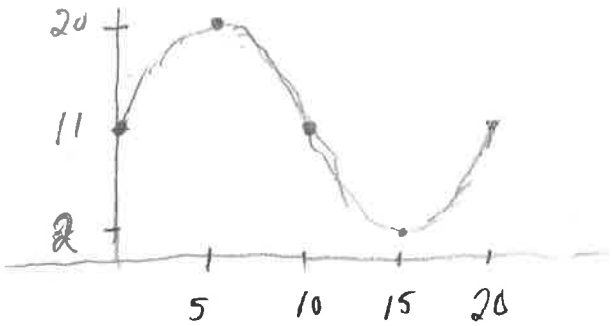
Model predicts $2(2.51) = 5.02$

3) At a county fair, the Ferris wheel has a diameter of 18m, and its centre is 11m above the ground. The wheel completes one revolution every 20s. At t=0 you are at the 3 o'clock position

a) Graph a rider's height above the ground, in meters, versus the time, in seconds, during a full revolution.

$A = \frac{18}{2} = 9\text{ m}$ $\quad d = 11$ $\quad$ Period $= 10$ sec

$B = \frac{2\pi}{20} = \frac{\pi}{10}$ $\quad y = 9\sin\frac{\pi}{10}t + 11$



t	y
0	11
5	20
10	11
15	2
20	11

b) Determine the amplitude, period, phase shift, and vertical shift of this function.

$\frac{18}{2} = A$ $\quad d = 11$ $\quad$ Phase shift None

c) Determine an equation that models the rider's height with respect to time.

$y = 9\sin\frac{\pi}{10}t + 11$

d) How high will the rider be after 42 seconds? (Round to the nearest hundredth)

$y = 9\sin\left(\frac{\pi}{10}\cdot 42\right) + 11$

$= 13.1\text{ m}$