Solving Problems using Trigonometric Functions

The table below displays the average high temperature, by month, in Central Park.

Average Monthly Temperature (°F)											
JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
38	42	50	61	71	79	84	83	75	64	54	43

a)

Use this data to write a function representing the temperature, $f(m)$, in month m, with January = 0. Graph this function on the axes below, labeling any critical values.

b) When is the average high temperature 78 degrees Fahrenheit?

BONUS:

Climate scientists believe that the average high temperature in Central Park for the month of July could increase by as much as 10° by 2050. Assuming that minimum average temperature stays the same, write a second function modeling this change and use it to predict the new average high temperature for the month of October.

Robert and his friend Hilda are riding in a Ferris wheel at the State Fair.

Height Above the Ground											
TIME (min)	0	1	2	3	4	5	6	7	8	9	10
ELEVATION (feet)	0	7	24	40	48	40	24	7	0	7	24

a) Predict Hilda and Robert's height at 15 minutes.

b) After 15 minutes, the two friends decide they want to get off the Ferris wheel. How much longer will they have to wait before they can exit the ride?

c) When are they at an elevation of 6 feet in the first 30 seconds?

d) When are they at an elevation of 42 feet in the first 30 seconds?

Think About It The model for the height h of a Ferris wheel car is

$h = 51 + 50 \sin 8\pi t$

When is the height of the Ferris wheel car 98 feet high?

Bonus:

Alter the model so that the height of the car is 1 foot when $t = 0$.

Sales Sales S, in thousands of units, of a seasonal product are modeled by

$$S = 58.3 + 32.5 \cos \frac{\pi t}{6}$$

where t is the time in months (with $t = 1$ corresponding to January and $t = 12$ corresponding to December). Use a graphing utility to graph the model for S and determine the months when sales exceed 75,000 units.