1. Below is a table of values.

x	y
2	7
4	13
6	
10	31
17	
34	
100	
n	

a)   What is the average rate of change between $x = 2$ and $x = 4$? Between $x = 2$ and $x = 10$? Between $x = 4$ and $x = 10$?

b)   In terms of the average rate of change, what does it mean to say that a function is linear?

c)   Find the missing values in the table assuming that the function represented is a linear function.

d)   Find a linear model for $f(x)$?

e)   Find $f(0)$. What does $f(0)$ represent?

f)   Find $0 = f(x)$. What does $0 = f(x)$ represent?

2.   A large koi pond is filled from a garden hose at the rate of 10 gallons/minute. Initially, the pond contains 300 gallons of water. Find a linear function that models the volume of water in the pond (in gallons) after t minutes.

a)   What does the rate of 10 gallons/minute tell us about the linear function?

b)   The statement "Initially, the pond contains 300 gallons of water" tells us a point on this line. What are the coordinates of this point? What does this represent in terms of the linear function?

c)   Using parts a) and b), find a linear function that models the volume of water in the pond, V (in gallons), after t minutes after filling began.

3.   A vending machine operator services the soda can machines at a freeway rest area. He finds that the number of cans of soda he sells each week depends linearly on the price that he charges. At a price of $1.00 per can, he sells 600 cans. At a price of $1.75 in the price, he sells 450.

a)   Give two points on this function as indicated by this problem.

b)   Using your answer in part a), find a linear equation that models the number of cans, N, that he sells as a function of p, the price of the soda cans.

c)   Find the slope of this line. What does the slope represent (in terms of the independent & dependent's relationship)?

d)   Find the y-intercept of this line. What does it represent (describe in terms of the units of the appropriate variable and with relation to the other variable)?

e)   Find the *x*-intercept of this line. What does it represent (describe in terms of the units of the appropriate variable and with relation to the other variable)?

4.   A solar electric company installs solar panels on the roofs of houses. A customer is informed that the amount of electricity produced is directly proportional to the number of solar panels installed and that 12 solar panels will produce 2.4 kilowatts of electricity.

a)   Suppose *x* represents the number of solar panels installed and *y* represents the amount of electricity produced (in kilowatts), determine the equation that relates the number of panels installed to the amount of electricity (in kilowatts) produced.

b)   How many kilowatts of electricity are produced by 16 panels?

c)   Suppose you want to produce 10 kilowatts of electricity, how many solar panels will you need installed?

d)   Sketch a graph of the equation you found in part (a).

5.   Medical researchers have found that there is a linear relationship between a person's blood pressure and their weight. In males 35 years of age, for every 5 pound (lb.) increase in a person's weight there is generally an increase in the systolic blood pressure of 2 millimeters of mercury (mmHg). Moreover, for a male 35 years of age and 190 pounds the preferred systolic blood pressure is 125. (Source: www.ash-us.org).

a)   Construct a formula for a 35-year-old male's systolic blood pressure as a function of his weight, $B(w)$. Assume that an average 35-year old male's systolic blood pressure is 125 mmHg.

b)   Give a practical domain and range for the function $B(w)$.

c)   Explain the meaning of the slope in the real world context.

d)   Determine the coordinates of the vertical intercept and explain its hypothetical meaning in the real world context.

e)   Determine the coordinates of the horizontal intercept and explain its hypothetical meaning in the real world context.

f)   Using the function, $B(w)$, predict the blood pressure for a 200 pound 35-year-old male.

g)   Evaluate $B(176)$ and explain its meaning in the real world context.

h)   Solve $B(w) = 114$ and explain its meaning of in the real world context.

i)   Graph the function $B(w)$ and label the axes with appropriate values.

6.   The table below shows the number of cricket chirps in 15 seconds, and the air
         temperature, in degrees Fahrenheit.

chirps	44	35	20.4	33	31	35	18.5	37	26
Temp	80.5	70.5	57	66	68	72	52	73.5	53

a)   Plot this data.
To plot the data, Enter STAT and EDIT on your calculator. List columns will appear.
Under L1, enter the x values (# of chirps) and under L2, enter the y values (temperature).
To clear a list, highlight L1 and enter CLEAR.
Now, go to STAT PLOT, which is 2nd Y= and hit ENTER for Plot 1.
Highlight ON, for TYPE: choose a scatterplot (1st one), XLIST: L1, YLIST: L2, MARK: your
choice. Quit and then ZOOM STAT (choice 9) to plot.
Set your window so that the x-values contain the range of values for # of chirps and the y-values
contain the range of values for temperature.

b)   Does the data appear to follow a linear pattern?

c)   In part (b), you are making a guess as to whether or not the data follows a linear pattern.
         Let us have the calculator help us determine if the data is linearly related.
Go to STAT, CALC, LinReg (ax+b). Hit Enter twice.

Look at the "r" value. Is this number between 0.8 and 1 or between –1 and –0.8? If so, a linear function is a good model for this data.
Write down the "r" value for this data.

d)   Find the regression line for this data. Write the model appropriately here.

e)   We use regression lines or lines of best fit to help us predict values. There are two types of predictions: **interpolation and extrapolation**.

Interpolation is the process of predicting the output value for an input value that lies between the maximum and minimum input values of the data set.

Extrapolation is the process of predicting the output value for an input value that comes before the minimum input value or after the maximum output value of the data set.

f)   Would predicting the temperature when crickets are chirping 30 times in 15 seconds be interpolation or extrapolation? Make the prediction, and discuss if it is reasonable.

e)   Would predicting the temperature when crickets are chirping 50 times in 15 seconds be interpolation or extrapolation? Make the prediction, and discuss if it is reasonable.

f)   What is the slope of the regression line? Interpret the slope in the context of the problem.

g)   What is the y-intercept of the regression line? Interpret the y-intercept in the context of this problem.