Aaron Warnock
Math 91 – Notes for Section IA 2.6

Linear Regression

[Before we begin, **QUIT (2nd MODE)** *(I don't like the terminology!) will exit you from a window you don't want to be in anymore.]*

1. **Enter** the **Data**
   - **STAT: EDIT**
     Enter the *x* data (be careful if dealing with years) in L_1 and the *y* data in L_2. Make sure your lists are of the same length, and the data points are correct.

2. **Graph** the **Data** points
   - **STAT PLOT (2nd Y=)**
     Turn on the first stat plot. (Make sure Xlist is L_1 and Ylist is L_2. It should already be set this way, and once you set it, you shouldn't have to do it again.)
   - You can set the window *manually*, or
   - **ZOOM: ZOOMSTAT** (menu item #9)
     This will give you exactly your points that you are plotting, so this is a good starting point. However, we will want to predict points beyond that, so now you can go to **WINDOW** and just expand beyond what has already been given to you.
   - **GRAPH**

4. Finding/graphing a **Linear Regression** equation
   - In the main calculator window (**QUIT** from the graphing section)
   - **STAT → CALC: LinReg (ax+b)** (menu item #4)
   - After you select this command, type **L_1,L_2,Y_1**
     (L_1,L_2 are actually not necessary, but ok; **Y_1** *is a must though.)*
     - **L_1** and **L_2** are on the 1 and 2 buttons, so "**2nd 1**" and "**2nd 2**"
     - **,** is right above the 7
     - **Y_1** is kind of interesting to find, so here it is
       - **VARS→Y-VARS: Function: Y_1**
   - Now you should have something that looks like **LinReg (ax+b) L_1,L_2,Y_1**
   - At this point, you must hit **ENTER** to tell the calculator to actually take the Linear Regression.
   - Too see the linear regression equation – **Y=**
   - Too see the graph of the linear regression equation – **GRAPH**

5. Evaluating new data, using your Linear Regression Equation
   - **TRACE**
   - You must now hit up or down, so that you are tracing the linear regression, and not the points. Otherwise, it will exit you to the main screen if you try to type.
   - Once you see **Y_1** in the upper left corner, now you can type in your data to find the information you need. Be careful if you are dealing with years to know when $x = 0$ is.
   - If you get an error message, make sure that your window is large enough to see the points you are trying to look at.

3. The average top ticket price for Broadway musicals has increased dramatically between 1975 and 2003.

Year	1975	1985	1998	2000	2003
Average Ticket Price	13.76	45.26	73.03	118.89	130.50

a) Using the data in the table, find the regression equation that best fits the data. (Let $x = 0$ represent the number of years since 1970.) Round to three decimal places.

b) Find the rate at which the cost is rising.

c) Predict the average top ticket price for Broadway musicals in the year 2013 if the trend continues to increase at the same rate.

4. The Academy Awards is one of the most watched television shows. The table below gives the average cost of a 30-second commercial slot for the years 1998 through 2003.

Years since 1990	8	9	10	11	12	13
Academy Award Commercial Cost (in millions of dollars)	0.9	1.0	1.2	1.35	1.25	1.4

a) Find the linear regression equation for the given data. Round to three decimal places.

b) If the rate continues to increase in the same manner, predict the cost of a 30-second commercial in the year 2010.

c) If the rate continues, what year will the cost of a 30-second commercial cost over $3,000,000?

1. The percent of female smokers 18 years and older has decreased from 1965 to 2002.

Years since 1960	5	14	25	30	35	40	42
Percent of Female Smokers	33.9	32.1	27.9	22.8	22.6	21	19.1

a) Use a linear regression to fit a line to the data in the table. Write the linear regression equation. Round to three decimal places.

b) Predict the percent at which female smokers are decreasing per year.

c) Predict the percent of female smokers in the year 2011 if the trend continues to decrease at the same rate. Round to the nearest tenth of a percent.

d) At what year will the percent of female smokers be zero? Is this reasonable?

2. Life expectancy at birth of males was rising in the U.S. between 1900-2001 according to the table below.

Year	1900	1930	1950	1970	1990	1999	2001
Life Expectancy	46.3	57.5	65.6	67.7	71.8	73.9	74.4

a) Using the data in the table, find the regression equation that best fits this data. (Let $x = 0$ represent the number of years since 1900.)

c) Predict the life expectancy of a male born in the year 2010 if this trend continues.

d) If the trend continues, what year will a male born have a life expectancy of 100 years?