A Brief Overview of Mathematical Modeling Using the TI-83 or TI-84

Entering data:
- Align the input data, if necessary. Generally we want input values to be fairly small. So for example, rather than using years such as 1995, 2000, 2005 you might align the data as "years after 1990" (5, 10, 15).
- Use [Stat][Edit] to enter data lists in your calculator. Input data should go in L1 and output data in L2.

Viewing a scatter plot:
- Use [2nd][Y=] to adjust Plot 1, if necessary. Turn the plot on, select scatter plot as the type (it's the first on the list), and make sure the X-list is L1 and the Y-list is L2.
- Use [Y=] to clear any functions from Y1, Y2, etc. Verify that Plot 1 is turned on (it should be highlighted at the top of the [Y=] screen.
- Press [zoom][stat] to have your calculator find an appropriate window in which to display the plot.

Creating a function:
- If a function type is not specified in the instructions of the problem, decide on one or two function types that might suit the general characteristics of the data plot (see the guidelines on at the end of Chapter 1 in the Lecture & Note-Taking Guide).
- Use [Stat][Calc] to choose the appropriate regression type and follow the regression command with instructions on where to store the function Y1, Y2, etc. (use [Vars][Yvars][Function] to choose the storage location).
- Press [Graph] to see the function you stored in Y1 graphed against the scatter plot and determine if the function fits the data well. If not, try a different function type and see if the results are better.

Writing the model:
- In writing the model, you may round to 3 decimal places, but be sure to keep the unrounded model stored in your calculator for use in computations.
- A complete model statement should be a sentence or two that include the function, output units & description, input variable with units and description, and the input interval of reliability (domain) of your data set.
Example:
The table shows the population of the contiguous states of the US for selected years between 1790 and 1990.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population in millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1790</td>
<td>3.929</td>
</tr>
<tr>
<td>1810</td>
<td>7.24</td>
</tr>
<tr>
<td>1830</td>
<td>12.866</td>
</tr>
<tr>
<td>1850</td>
<td>23.192</td>
</tr>
<tr>
<td>1870</td>
<td>39.818</td>
</tr>
<tr>
<td>1890</td>
<td>62.948</td>
</tr>
<tr>
<td>1910</td>
<td>91.972</td>
</tr>
<tr>
<td>1930</td>
<td>122.775</td>
</tr>
<tr>
<td>1950</td>
<td>150.697</td>
</tr>
<tr>
<td>1970</td>
<td>202.229</td>
</tr>
<tr>
<td>1990</td>
<td>247.052</td>
</tr>
</tbody>
</table>

Align the input data to years after 1790 and find the best fitting model. Completely define your model.

Aligned input data: 0, 20, 40, 60, 80, 100, 120, 140, 160, 180, 200

STAT-EDIT
ZOOM9 with Plot 1 on

The two function types that might fit the data are the **quadratic** and **exponential**.

Try Quadratic:

STAT-CALC
VARS-YVARS-1-2
ZOOM9 with Plot 1 and Y1 “on”

Try Exponential:

STAT-CALC
VARS-YVARS-1-1
ZOOM9 with Plot 1 and Y2 “on” (turn Y1 “off”)

Answer:

\[ P(x) = 0.006x^2 - 0.053x + 4.652 \] million people gives the population of the contiguous United States, where \( x \) is the number of years since 1790 for \( 0 \leq x \leq 200 \).