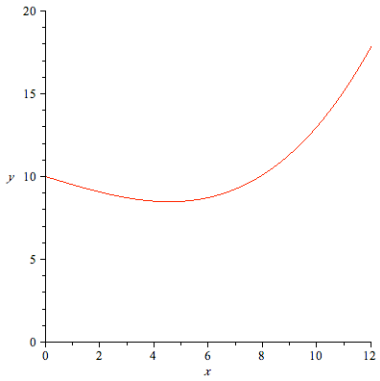
After watching the video, *Representing Data Carefully*, complete the following problems.

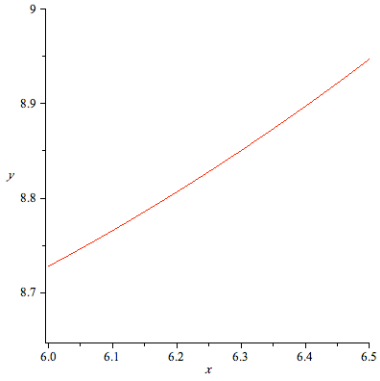
1. Since most people have a strong intuition about the behavior of straight lines, we like it when data form a relatively straight line as opposed to a more complicated curve. It turns out, that for the smooth curves we often encounter, if we restrict our attention to a very small region, they look like lines.

   Over a 12-month period, the assets of a business are approximated by $y = \frac{x^3}{125} - \frac{x}{2} + 10$, where x is the number of months since the start of last year and y is measured in tens of thousands of dollars.

   a. Graph this curve over the interval $0 \le x \le 12$, $0 \le y \le 20$ using a graphing calculator or computer. Is it linear?
   Clearly, it is not linear.



   b. Now we are going to examine the first half of month six. Graph this curve over the interval6 ≤ x ≤ 6.5, 8.65 ≤ y ≤ 9. Does the curve look like a straight line?
   Notice that the curve looks like a straight line. (It isn't perfectly straight, of course, but it is close enough that the viewer can apply intuition about straight lines to this representation of what is going on in the first half of month six.)



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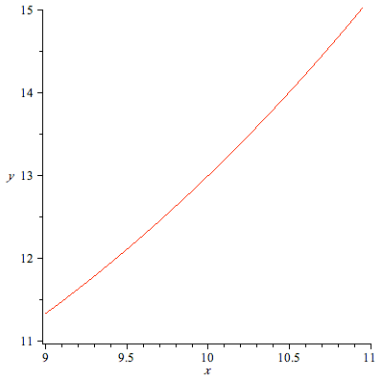
c. Find an x-range centered about x = 10 and an accompanying y-range for which the curve looks linear.
There are many possible solutions. Below is an example using: $9 \le x \le 11, 11 \le y \le 15$.



2. When choosing a measure of center, sometimes the mean is the largest number, sometimes the median is the largest, and sometimes the mode is the largest.
   a. Find a small set of data for which mean < median < mode.
   1, 2, 3, 4, 4
   Mean is 2.8; median is 3; and mode is 4.

   b. Find a small set of data for which mean < mode < median.
   0, 0, 10, 10, 10, 11, 11, 12, 12, 13, 13
   Mean is about 9.3; mode is 10; and median is 11.

   c. Find a small set of data for which median < mean < mode.
   1, 2, 3, 5, 5
   Median is 3; mean is 3.2; and mode is 5.

   d. Find a small set of data for which median < mode < mean.
   1, 2, 3, 4, 4, 11
   Median is 3.5; mode is 4; and mean is about 4.2.

   e. Find a small set of data for which mode < median < mean.
   1, 1, 2, 3, 4
   Mode is 1; median is 2; and mean is 2.2.

   f. Find a small set of data for which mode < mean < median.
   1, 1, 3, 4, 5
   Mode is 1; mean is 2.8; and median is 3.

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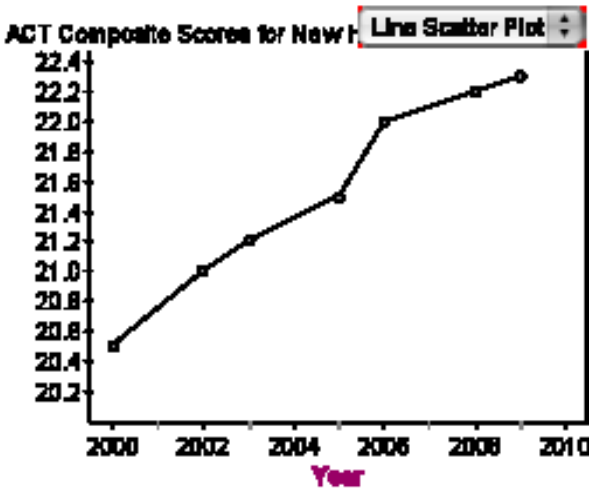
3. A new bakery, called Scratch, recently opened. The second month's revenues have increased by 400% from the first month (from $4,000 to $20,000). The third month is forecasted to be another increase but only an increase of 100%. Should the bakery be worried about this smaller increase?
   The bakery should not be worried in this case because a 100% increase is $20,000. The 400% increase was a total increase in revenue of $16,000. The increase from the second to the third month is $4000 greater than the increase from month 1 to month 2.

4. Below are the mean ACT scores for New High School's graduating classes from 2000-2009. The corresponding data is on the right as well. Answer the questions using the graph and the given data.

ACT Composite Scores for New High School

	Year	ACT_coÉ	<new
1	2000	20.5	
2	2001	20.3	
3	2002	21.0	
4	2003	21.2	
5	2004	20.8	
6	2005	21.5	
7	2006	22.0	
8	2007	20.9	
9	2008	22.2	
10	2009	22.3	



   a. Is the above graph an accurate representation of the data?
      Yes and no. The points are all accurate but several years were not included in the data. The missing points would reflect more inconsistent performance over the years. By connecting the points, the graph misleads the reader into thinking there was a steady increase.

   b. Create a graph that would support a claim that ACT scores have held relatively stable over the years.
      The ACT has a minimum score of 0 and a maximum score of 36. If the vertical axis changes to reflect the minimum and maximum, the scores appear consistent. Mathematically the points should not be connected because the data is discrete. The lines provide a strong visual representation of nearly a horizontal line.

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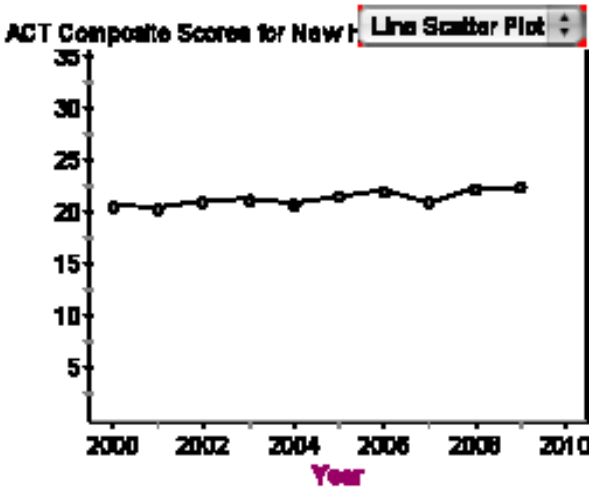

c. Create a graph that would support a claim that ACT scores have been inconsistent over the years.

Creating a smaller range exaggerates the changes in scores from year to year. Again the points should not be connected because the data is discrete, but the lines add emphasis to a dip or increase in scores.

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