Is the Globe Warming?

The Goddard Institute for Space Studies (see http://data.giss.nasa.gov/gistemp/tabledata/GLB.Ts.txt), has recorded mean temperatures for the decades 1880 - the present. Here's their data, coded so that 1800 is "year 0". That means "8" is the 1880s, "12" is the 1920s, etc.

Decade	Code for Decade X	Degrees Celsius Y	
1880-1889	8	13.82	(This is 56.876° F.)
1890-1899	9	13.69	(°F = 1.8 °C + 32)
1900-1909	10	13.74	
1910-1919	11	13.79	
1920-1929	12	13.91	
1930-1939	13	14.02	
1940-1949	14	14.05	
1950-1959	15	13.98	
1960-1969	16	13.94	
1970-1979	17	14.02	
1980-1989	18	14.26	
1990-1999	19	14.40	
2000-2005	20	14.62	(This is 58.316° F.)

Using your calculator, (a) find the Least Squares Line that predicts the average temperature (Y) when given the coded value for a decade (X). Put your answer here:

Y = _____ X + _____. Also record r^2: _____

(b) Use your function to approximate the average temperature in the decade of the 2060s. (If you are a freshman, this will probably be the first decade you are retired.)

Y(_____) = _____.

Now graph your points and your function. Note that the points "bend" but the line, of course, is straight. Recall from algebra that the graph of a quadratic function can bend. Your calculator can easily produce a quadratic function ($Y = a X^2 + bX + c$). All you have to do is choose 5:QuadReg from the STAT|CALC menu (instead of 4:LinReg(ax+b)).

(c) Re-run the regression choosing the quadratic model. Record your results here:

Y = _____ X^2 +_____ X + _____. Again record r^2: _____

Graph your new model. Note the fit. Is it better than the line? _____

(d) And once again, predict the mean temperature in the decade of the 2060s:

Y(_____) = _____.

(e) What major world event occurred in the late '30s and early '40s?

_____

Additional information: The value r^2 (which is just the square of the correlation coefficient "r", and is called the "coefficient of determination") tells us, in layman's terms, the proportion of variation in Y that is described by the variation in X. More simply, if r^2 is closer to 1, the curve "fits" the points better. We'll discuss this more in class. For now, note the two values of r^2.

Very important assignment:

In a paragraph or two, tell which model above (the quadratic model or the linear model) you believe to be the more credible. Explain your choice. If you don't believe either tells the story of the globe's warming, explain your belief. In either case, base your explanation on DATA, not just your gut feelings. An extra credit homework grade will be given if the writing assignment is word-processed.