MATH 1342

Section 5.5

Non-Linear Methods

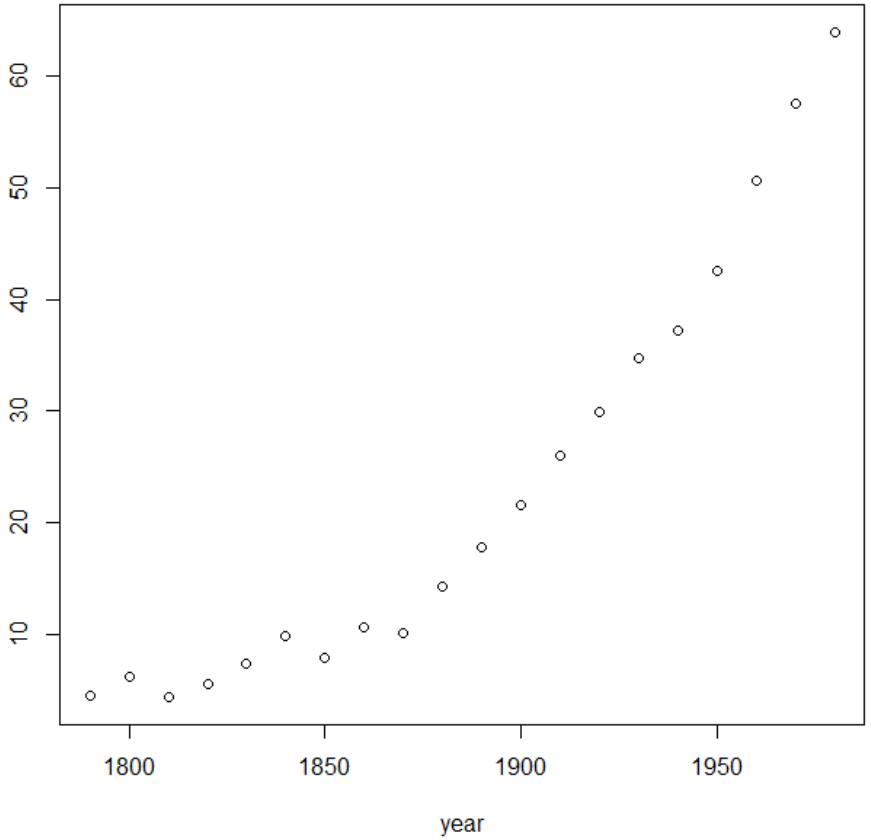
Many times a scatter-plot reveals a curved pattern instead of a linear pattern.

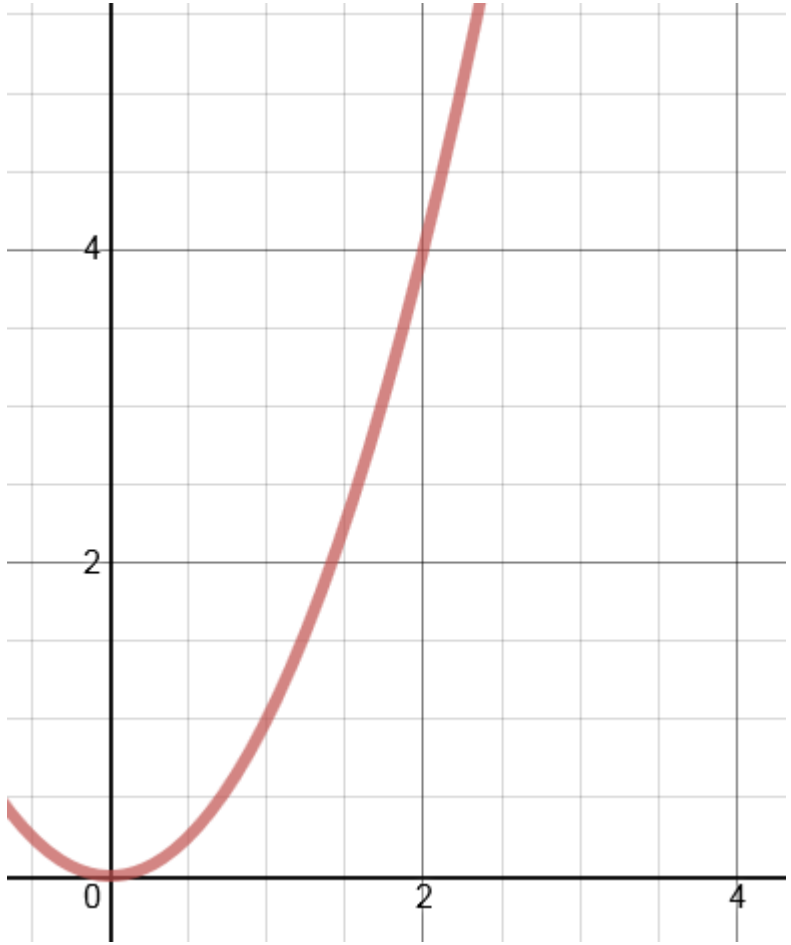
We can **transform** the data by changing the scale of the measurement that was used when the data was collected. In order to find a good model we may need to transform our *x* value or our *y* value or both.

In this example from section 5.4, we saw that the linear model was not a good fit for this data:

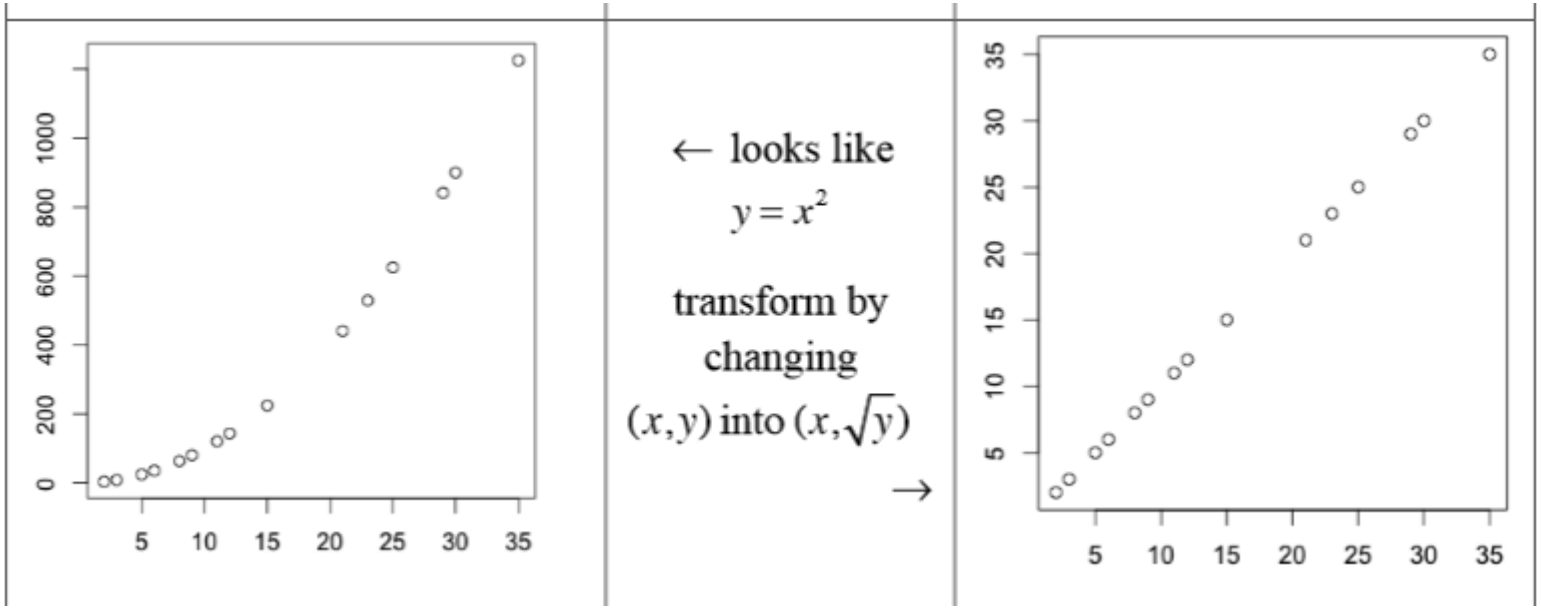
Year	1790	1800	1810	1820	1830	1840	1850	1860	1870	1880
People per square mile	4.5	6.1	4.3	5.5	7.4	9.8	7.9	10.6	10.09	14.2
Year	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980
People per square mile	17.8	21.5	26	29.9	34.7	37.2	42.6	50.6	57.5	64

Obviously, this does not look like a straight line. It looks more like a parabola.





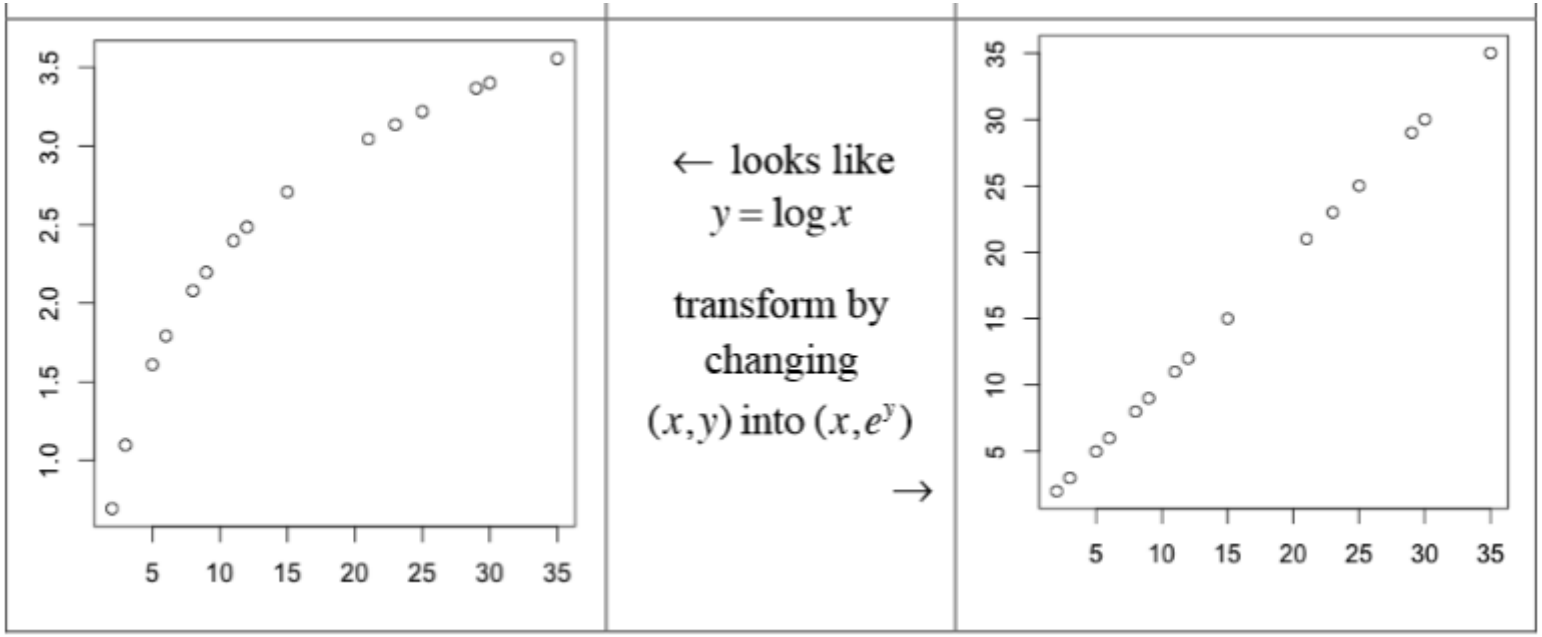
How to change the graph.



in R Studio:
sqrtpeople=sqrt(people)
plot(year,sqrtpeople)

Illustrations from the textbook.

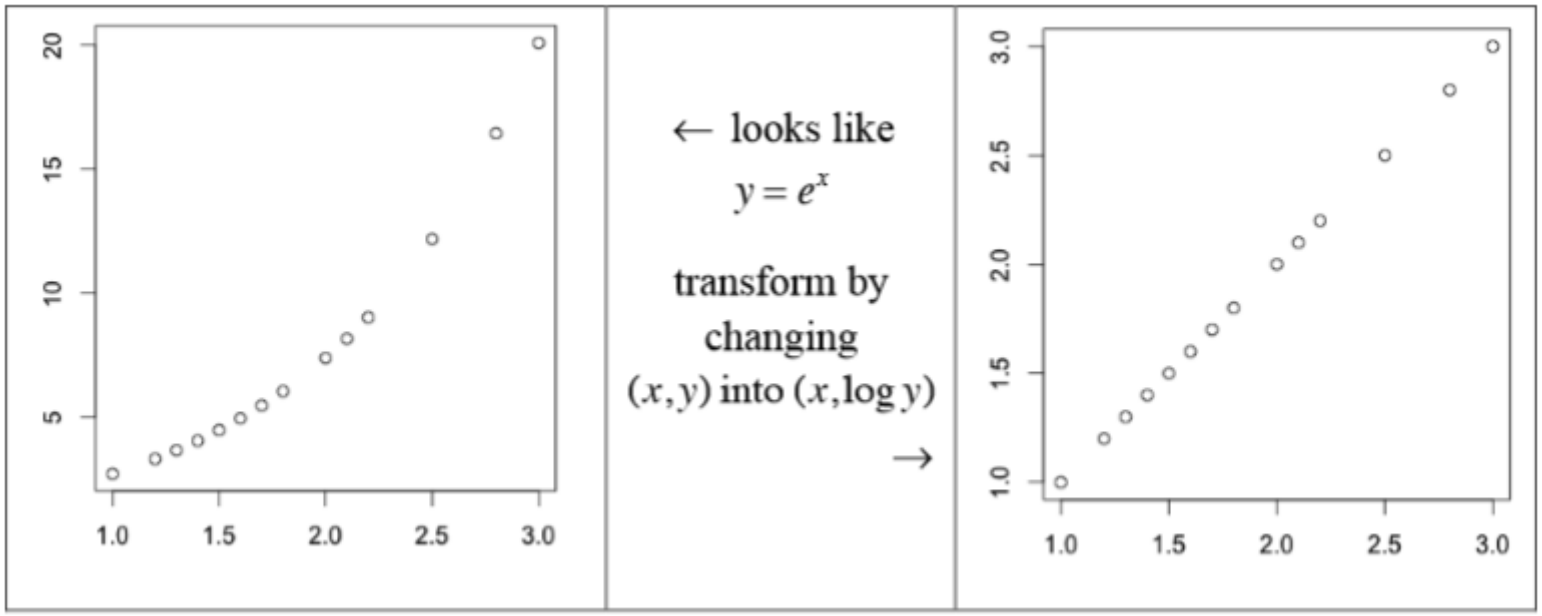
How to change the graph.



in R Studio:
exppeople=exp (people)
plot(year,exppeople)

Illustrations from the textbook.

How to change the graph.



in R Studio:
logpeople=log(people)
plot(year,logpeople)

Illustrations from the textbook.

Compare the scatterplots for linear regression and quadratic regression.

Find the r^2 values for each to determine the best curve of fit.

For the Linear Model

For the Quadratic Model

For the Logarithmic Model

For the Exponential Model

Which (of the above models) is the best model of this data? Why?