The University of Georgia

Mathematics Education
EMAT 4680/6680 Mathematics with Technology
Jim Wilson, Instructor

Additional Exploration using Excel

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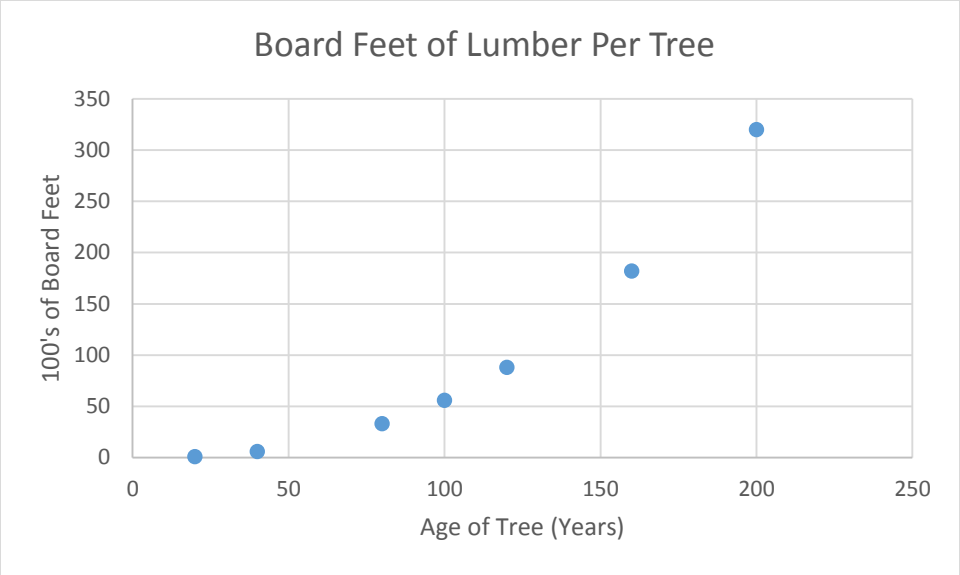
Use the following exploration to generate a function to predict observed data.

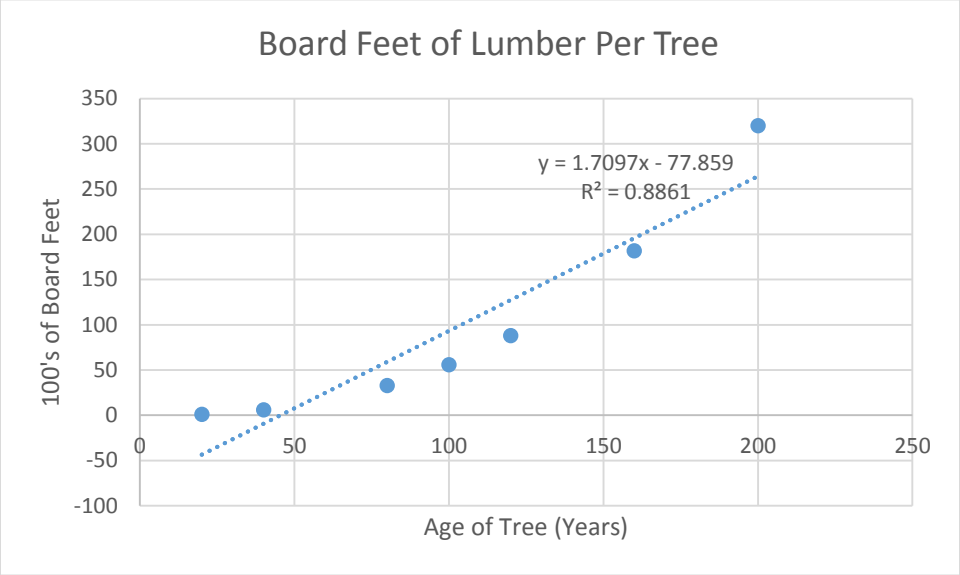
Age of Tree	100s Board Feet
20	1
40	6
60	
80	33
100	56
120	88
140	
160	182
180	
200	320

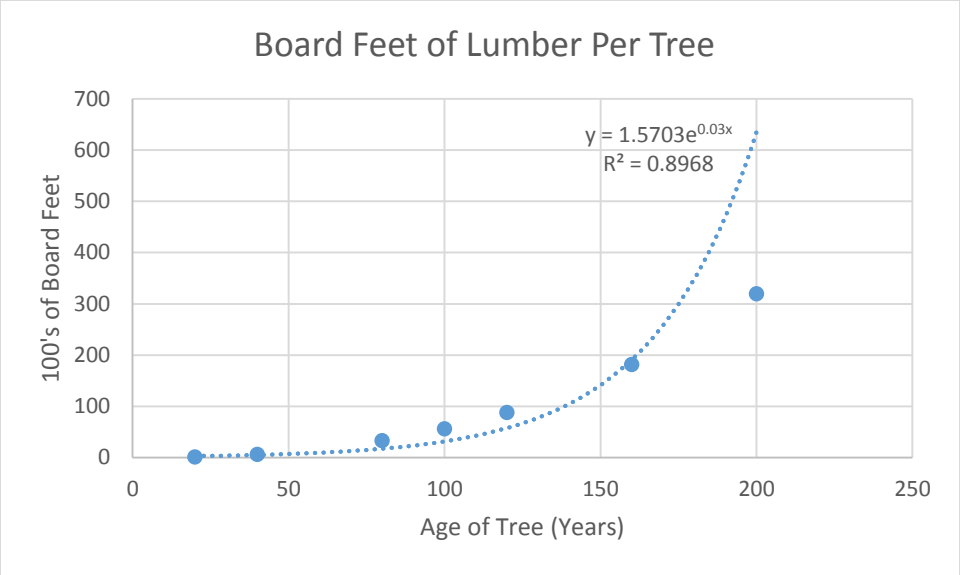
This data is from the lumber industry, giving the approximate number of board feet of lumber per tree in a forest of a given age. What function will fit the data? Predict the harvest for ages other than those given.

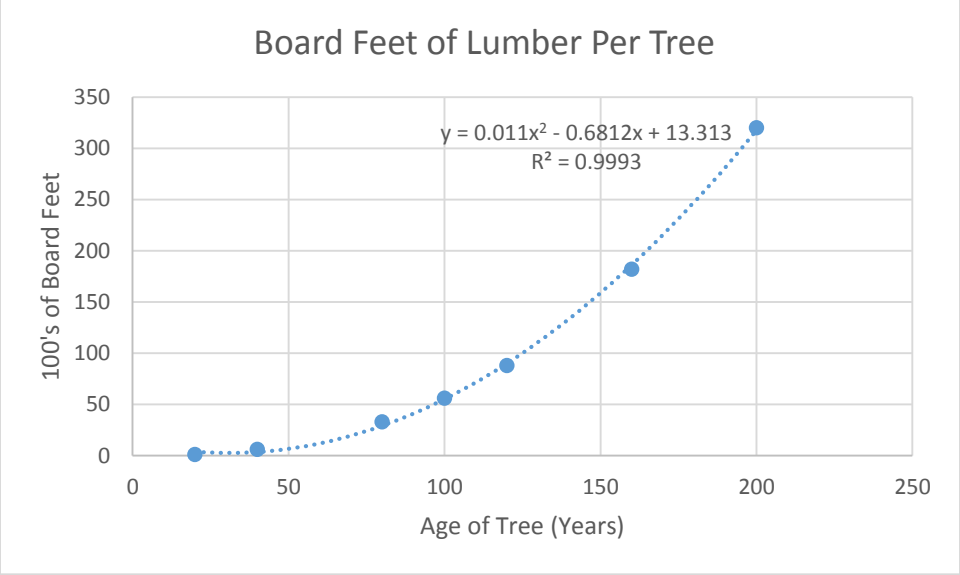
Below is a scatterplot of the data:

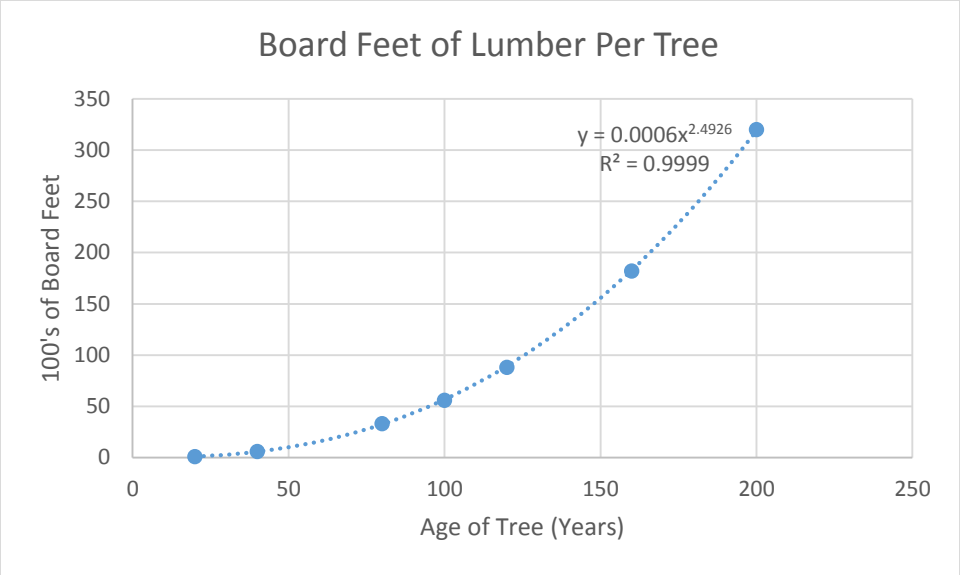


Below is a scatter plot of the data with four different lines of best fit. The first being linear, the second exponential the third polynomial, and the fourth power. Each equation for each line of best fit is included on the graph along with the coefficient of determination.




Board Feet of Lumber Per Tree
y = 1.5703e^0.03x
R² = 0.8968
100's of Board Feet
Age of Tree (Years)
0
100
200
300
400
500
600
700
0
50
100
150
200
250


Board Feet of Lumber Per Tree
y = 0.011x² - 0.6812x + 13.313
R² = 0.9993
100's of Board Feet
Age of Tree (Years)
0
50
100
150
200
250
300
350
0
50
100
150
200
250



The fourth line of best fit is the most appropriate line for our data set. 99.99% of the variation in our response variable (100's of Board Feet) is explained by the fitted regression equation $\hat{y}=0.0006x^{2.4926}$.

We can use this equation in order to make predictions as shown in the table below.

Age of Tree	100's of Board Feet	$\hat{y}=0.006x^{2.4926}$
20	1	1.05
40	6	5.91
60		16.23
80	33	33.25
100	56	57.99
120	88	91.35
140		134.15
160	182	187.13
180		250.98
200	320	326.36

From the equation of the line of best fit we can predict that a tree that is 60 years old in this particular forest will contain 16.23 100's of board feet.