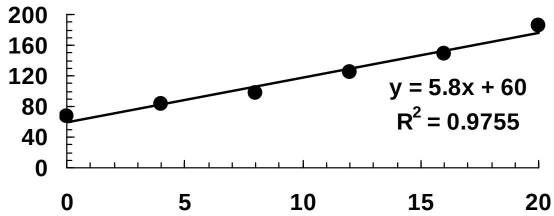
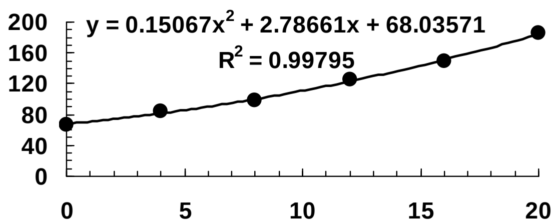
Solution 17.26

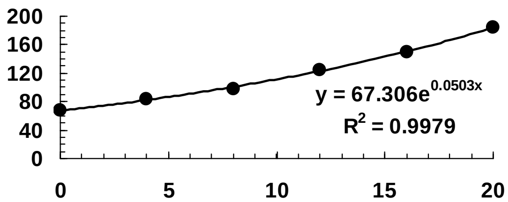
This problem was solved using an Excel spreadsheet and Trend Line. Linear regression gives



Polynomial regression yields a best-fit parabola



Exponential model:



The linear model is inadequate since it does not capture the curving trend of the data. At face value, the parabolic and exponential models appear to be equally good. However, knowledge of bacterial growth might lead you to choose the exponential model as it is commonly used to simulate the growth of microorganism populations. Interestingly, the choice matters when the models are used for prediction. If the exponential model is used, the result is

$$B = 67.306e^{0.0503(40)} = 503.3317$$

For the parabolic model, the prediction is

$$B = 0.15067t^2 + 2.78661t + 68.03571 = 420.5721$$

Thus, even though the models would yield very similar results within the data range, they yield dramatically different results for extrapolation outside the range.