**ENGR 2013: Engineering Analysis and Applications**

**Laboratory No. 7: Who Wants to Be a Billionaire? – Part II**

**Goal:** Understand how to fit a curve with higher order polynomials.

**Preliminary Work:** Replicate Example 3.2.10 in the textbook (Polynomial Interpolation) in the textbook in Python.

**Tasks:**

1. Building on what you did for Lab No. 2, create a table of values for your favorite stock that includes at least 11 points spaced logarithmically in time from yesterday to 6 months ago (we need a few points close in time to today, and a few points further away in time, so we can use both short‑ and long‑term behavior in our prediction model). These points should adequately cover the ‘interesting’ behavior in the stock (e.g., unpredictable ups and downs).
2. Estimate the coefficients of polynomials of order 2 to 10 from this data. Note that for order 2 you will need 3 data points. For order 3, you will need 4 data points. Why?
3. Plot the actual stock data and your predicted value (over all time). This plot should show you how the prediction model does as a function of the model order. Construct separate plots for each model order.
4. Construct a plot of the actual stock data and overlay plots of what you consider your worst model and your best model. Discuss how well these models predict future values of the stock. Can you compute the average value of square of the error (mean square error)? What does this tell you? Does the model get better as the order increases? Does the error decrease with model order?
5. Use Excel to fit a spline to your data. You might find [this video](https://www.youtube.com/watch?v=tHjqW5ic0jM) useful. How does this fit compare to your best polynomial fit?

**Summary:**

So… you didn’t become a billionaire from lab no. 2. Why not? What were the weaknesses of that method? What are the strengths of this new method compared to lab no. 2? Weaknesses?

Later in the semester we will learn an even better way to do this type of prediction.