**Class 6** – **Polynomial Interpolation (Chp. 17)**

ChE310\_Sec1\_F2019 9.12.2019

<http://www.reuelgroup.org/numerical-methods-che-310.html>

**Group Activity:** submit to Slack by 2:25pm.

We need more practice of using for loop with indexing. Create a script that reads in the salary data file, and calculates the amount of taxes using the following formula:

Age < 30, Tax = salary\*.07-Age\*10

30 <= Age < 60, Tax = salary\*.08-Age\*20

60 <= Age, Tax = salary\*0.09-Age\*30

Create a histogram of taxes paid by this population.

**Outline for Class 6 Lecture**

1. Probability EXAMPLE – Antibodies [end class]
   1. Random number generator from pdf
   2. Fit a pdf
   3. Use cdf to predict probability
2. Linear regression vs. interpolation



1. Polynomial vs. piecewise (Tuesday)
2. Examples of tabulated data
   1. Optical Character Recognition (OCR)
3. Interpolation forms (N.B. for ‘n’ number of points, there is ONE unique interpolation polynomial of order (n-1). However, there are a couple of unique forms:

*Matlab* – concise, not simple to solve by hand



*Newton* – can add terms to end to increase accuracy without re-computing. Efficient to solve by hand.

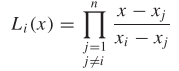


b coefficients are found by finite differences (pg. 413)

Algorithm available on pg. 416

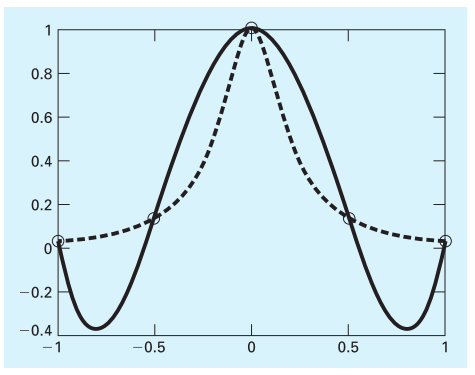
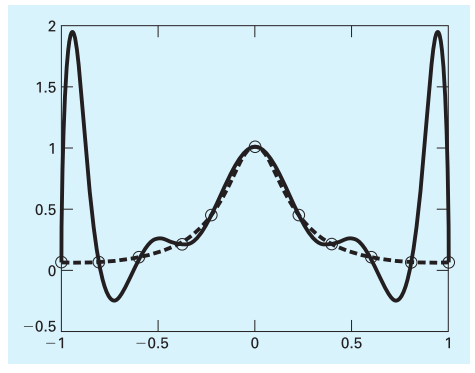
*LaGrange* – visualized as summation of lines



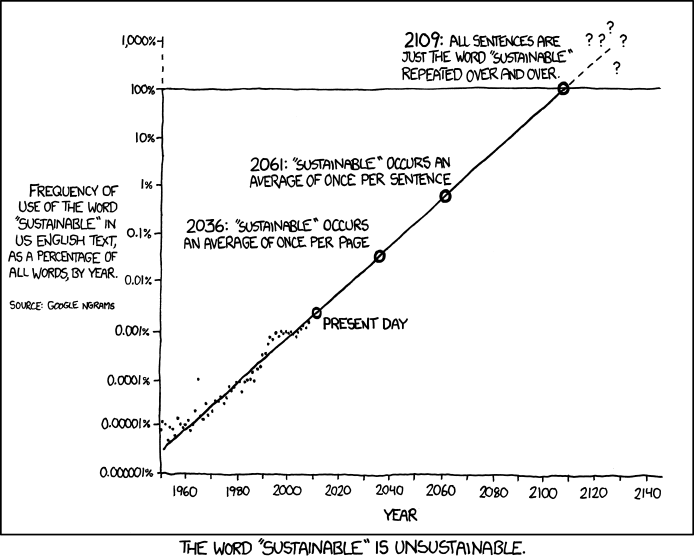


Algorithm on pg. 419, simplest to do by hand

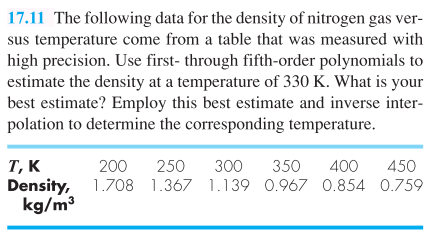
1. Polynomial breakdown (higher order)
   1. f(x) = 1/(1+25\*x^2) (Runge)

1. Extrapolation
   1. A past trend does NOT guarantee extension into future state.
   2. Avoid extrapolation
   3. Understand limits of your data table



1. Using MATLAB to perform polynomial interpolation
   1. **polyfit**
   2. **polyval**
   3. Demonstrate with problem 17.11 from textbook.



1. Discuss inverse interpolation + centering
   1. DO NOT simply invert the vectors…why? Spacing of data could create oscillations
   2. Always check your interpolated fit, does it make sense?

