Homework #4 Due: Monday October 24 MTHBD/CMPBD 423

1. Interpolating data with the Newton Interpolation Polynomial. *(10 pts)*

   Find the coefficients $(c_0, c_1, \ldots, c_n)$ of the interpolating polynomial in the form:

   $$p_n(x) = c_0 + c_1(x - x_0) + c_2(x - x_0)(x - x_1) + \ldots + c_n(x - x_0)(x - x_1)\cdots(x - x_{n-1})$$

   which interpolates the following data.

x	0	2	4	6	8
y	15	-17	-125	-285	-377

   Use the method of divided differences to calculate these coefficients. Fill in the coefficients and the divided difference table used to generate these coefficients on the cover sheet.

2. Approximate $f(x) = \frac{1}{1+x^2}$ with $P_{10}(x)$ over the interval $[-5, 5]$ using 11 equally spaced nodes where $x_0 = -5$. Plot $f(x)$ and $P_{10}(x)$ over the vector $x = -5 : .1 : 5$. Now superimpose on this a graph of $P_{10}(x)$ using the Chebyshev nodes plotted over the same x values. So the figure should contain 3 graphs: The function, The polynomial interpolating 11 equally spaced nodes, and the polynomial interpolating 11 Chebyshev nodes. Clearly label each curve. You may use MATLAB's **polyfit** and **polyval** functions if you want but you have to learn how to use them properly. Staple this to the back of the cover sheet. *(10 pts)*