Math 105B
Computer Assignment 2
Due Friday 1/18, 10pm

The aim of this lab is to write a function to compute the Newton forward divided differences and then to use the divided differences to compute a Lagrange interpolating polynomial.

The algorithm for Newton's divided difference formula is:

INPUT $X = (x_0,...,x_n)$, $Y = (f(x_0),...,f(x_n)) = (F_{0,0}, F_{1,0},...,F_{n,0})$

OUTPUT $F_{i,j} = f[x_{i-j},...,x_i]$, the divided differences

and the Lagrange interpolating polynomial is $P_n(x) = F_{0,0} + \sum_{i=1}^{n} F_{i,i} \prod_{j=1}^{i-1} (x - x_j)$

STEP 1. For i=1,2,…n
For j=1,2,..,i

$$F_{i,j} = \frac{F_{i,j-1} - F_{i-1,j-1}}{x_i - x_{i-j}}$$

end
end

STEP 2. OUTPUT $F_{i,j} = f[x_{i-j},...,x_i]$
STOP

(1). Write a matlab routine called homework2.m that calls a function that you write to compute the Newton's divided difference formula.
(2). Use the function to interpolate the tabular function given below at the point x=0.05.

x	*f(x)*
0.0	-6.0
0.1	-5.89483
0.3	-5.65014
0.6	-5.17788
1.0	-4.28172

What is your estimate of the error of using the fourth degree Lagrange interpolating

polynomial? Justify your answer.
(3) Add the point x=1.1, f(1.1)=-3.99583 to the table, and construct the interpolating polynomial of degree 5. Evaluate the Lagrange polynomial at x=1.05. What is your estimate of the error? Justify your answer.