

Name _____
Spring 2007

Score _____

MATH 442 Homework 3

Carefully Read and Follow Directions Clearly label your work and attach it to this sheet. No credit will be given for unsubstantiated answers.

1. Let $f(x)$ be a polynomial of degree $\leq n$. Let $p_n(x)$ be the Lagrange polynomial of degree $\leq n$ that interpolates f at the nodes x_0, x_1, \dots, x_n . Show that $f(x) = p_n(x)$ for all x . (HINT: Show that the error function $f(x) - p_n(x) = 0$ is identically zero.)
2. You are given the following data based on the function $f(x) = e^{-x}$.

i	0	1	2	3	4
x_i	0.0	1.0	2.0	3.0	4.0
y_i	1.000	0.36788	0.13534	0.04979	0.01832

- (a) Compute the divided difference table for the tabulated function.
 - (b) Write down the Newton polynomials $p_0(x), p_1(x), p_2(x), p_3(x), p_4(x)$
 - (c) Evaluate the Newton polynomials in part (b) at $x = 0.5$ and at $x = 1.5$.
 - (d) Compare the values in part (c) with the actual function values. That is, compute $|f(x) - p_k(x)|$ for each k and for each x . A table of these values is suitable here.
3. Lab 1 (Download instructions and *.m* files from the course webpage.)