M348-53610: Scientific Computing
Homework # 06
Handout: 03/01/2016, Tuesday
Due: 03/08/2016, Tuesday

Submission. Please make your homework neat and stapled. You have to submit your homework in ECJ 1.204 before **3:00 PM** on the due date. Note that *no late homework will be accepted without compelling reasons.*

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1 To be Graded

Problem 1. Use Neville's method to obtain the approximations for Lagrange interpolating polynomials of degrees one, two, and three to approximate each of the following:
(a) $f(8.4)$ if

$$f(8.1) = 16.94410,\ f(8.3) = 17.56492,\ f(8.6) = 18.50515,\ f(8.7) = 18.82091$$

(b) $f(-\frac{1}{3})$ if

$$f(-0.75) = -0.0718125,\ f(-0.5) = -0.0247500,\ f(-0.25) = 0.3349375,\ f(0) = 1.1010000$$

Problem 2. Suppose $x_j = j$, for $j = 0, 1, 2, 3$ and it is known that

$$P_{0,1} = x + 1, \quad P_{1,2}(x) = 3x - 1, \quad \text{and } P_{1,2,3}(x) = 4.$$

Find $P_{0,1,2,3}(1.5)$.

Problem 3. Neville's method is used to approximate $f(0.5)$, giving the following table. Determine $P_2 = f(0.7)$.

$x_0 = 0$	$P_0 = 0$		
$x_1 = 0.4$	$P_1 = 2.8$	$P_{0,1} = 3.5$	
$x_2 = 0.7$	P_2	$P_{1,2}$	$P_{0,1,2} = \frac{27}{7}$

Problem 4. Using our notations in class, the Newtons Divided-Difference formula for polynomial interpolation of degree n can be written as

$$P_n(x) = f[x_0] + \sum_{k=1}^{n} f[x_0, x_1, \cdots, x_k](x - x_0)\cdots(x - x_{k-1})$$

Use this formula to construct interpolating polynomials of degree one, two, and three for the following data.

$$(a).\ f(8.1) = 16.94410,\ f(8.3) = 17.56492,\ f(8.6) = 18.50515,\ f(8.7) = 18.82091$$

$$(b).\ f(0.6) = 0.17694460,\ f(0.7) = 0.01375227,\ f(0.8) = 0.22363362,\ f(1.0) = 0.65809197.$$

2 Reading Assignments

- Review Sections 3.2 and 3.3 of Burden & Faires or Sections 2.1 and 4.2 of Epperson.