Math 128A: Worksheet #5

Name: ______________________________ Date: February 24, 2021

Spring 2021

Problem 1 (3.2 #1a)**.** Use Neville's method to obtain the approximations for Lagrange interpolating polynomials of degrees one, two, and three to approximate the following:

$$f(8.4) \text{ if } f(8.1) = 16.94410, \quad f(8.3) = 17.56492, \quad f(8.6) = 18.50515, \quad f(8.7) = 18.82091$$

Problem 2 (3.3 #3b)**.** Use the Newton forward-difference formula to construct interpolating polynomials of degree one, two and three for the following data. Approximate the specified value using each of the polynomials.

$$f(0.25) \text{ if } f(0.1) = -0.62049958, \quad f(0.2) = -0.28398668, \quad f(0.3) = 0.00660095, \quad f(0.4) = 0.24842440$$

Problem 3 (3.4 #1b and #3b).

1 b. Use the Hermite theorem or divided differences to construct an approximating polynomial for the following data:

x	$f(x)$	$f'(x)$
0.8	0.22363362	2.1691753
1.0	0.65809197	2.0466965

3b. This data was generated by the function $f(x) = \sin(e^x - 2)$. Use the interpolating polynomials from 1b. to approximate $f(0.9)$.

Problem 4. Consider the function $f(x) = \cos(x)$. Use divided differences to compute the interpolation polynomial $H(x)$ of degree at most 2 satisfying

$$H(0) = f(0), \quad H(\pi/2) = f(\pi/2), \quad H'(\pi/2) = f'(\pi/2).$$

For small $\varepsilon > 0$, compute the interpolation polynomial $L(x)$ of degree at most 2 satisfying

$$L_\varepsilon(0) = f(0), \quad L_\varepsilon(\pi/2 - \varepsilon) = f(\pi/2 - \varepsilon), \quad L_\varepsilon(\pi/2 + \varepsilon) = f(\pi/2 + \varepsilon).$$

Let ε approach 0. What do you observe and why?