MATH 3043, Numerical Analysis I
Fall 2018

Lab 5

This lab will have you implementing divided differences to construct interpolating polynomials and generate approximations for function values.

Solutions must be submitted on Canvas and are due **October 15** at the beginning of lab. Please submit a single script file `Lab5Lastname.m` and the corresponding published file `Lab5Lastname.pdf` (for example, my submitted files would be `Lab5Zumbrum.m` and `Lab5Zumbrum.pdf`). Each solution should

- be contained in a separate cell which includes the problem number and short problem description,
- run independent of other cells,
- be adequately commented.

1. Use divided differences to construct the interpolating polynomial of degree four for the following data:

x	$f(x)$
0.0	-6.00000
0.1	-5.89483
0.3	-5.65014
0.6	-5.17788
1.0	-4.28172

   (a) Plot the data (using red circles) and the interpolating polynomial (using a solid black line) for $x \in [-0.5, 1.5]$ in the same figure.

   (b) Approximate $f(0.9)$ using the interpolating polynomial.

   (c) Add $f(1.1) = -3.99583$ to the data and create a new plot that includes the data (using red circles), the interpolating polynomial from Problem 1(a) (using a solid black line), and the new interpolating polynomial created by adding $f(1.1)$ (using a solid blue line).

2. The fastest time ever recorded in the Kentucky Derby was by a horse named Secretariat in 1973. He covered the $1\frac{1}{4}$ mile track in 1:59.4 (one minute and 59.4 seconds). Times at the quarter-mile, half-mile, and mile poles were 0:25.2, 0:49.2, and 1:36.4. Use interpolation to predict the time at the three-quarter mile pole and compare this to the actual time of 1:13.

3. The following function data represents points on a polynomial:

x	$f(x)$
0	0
1	-2
2	-8
3	0
4	64
5	250
6	648
7	1372

Use divided differences to determine the degree of the polynomial.