MATH 131: Numerical Methods for scientists and engineers – Lecture 12 Activities

The goals of this lecture are:

- Numerical Differentiation
- Numerical Integration.

Roles for today:

- Facilitator: In charge of keeping the group on task (most pets by weight)
- Reporter: In charge of reporting your findings to the class if asked (2nd most pets by weight)
- Submitter: In charge of submitting the group work on Catcourses (3rd most pets by weight)
- Time-Keeper: In charge of keeping the group on task with respect to time (4th most pets by weight)

1. As a group, create a Matlab Script that **contains the names of everyone who is in the group today**. Have the Facilitator share their screen with the given matlab script. The goal is to compute the 3point endpoint and 3point midpoint estimation of $f(x) = \ln x$ at $x = 1.8$ with $h = 0.1$. Recall that the formula are given by:
   - 3-point endpoint: $f'(x_0) = \frac{1}{2h}[-3f(x_0) + 4f(x_0 + h) - f(x_0 + 2h)]$
   - 3-point midpoint: $f'(x_0) = \frac{1}{2h}[f(x_0 + h) - f(x_0 - h)]$

   Use the provided .m file to help you along
2. Consider the 2 points given by $(x_0, f(x_0))$ and $(x_1, f(x_1))$. Note $x_1 = x_0 + h$ may help with simplification down the line.
   (a) Write the Lagrange Interpolating Polynomial $P(x)$ using the two points given above
   (b) Integrate the formula you obtained in a) to obtain an estimate for $\int_a^b f(x)dx$.