AUMAT/AUPHY/AUCSC 340 – Numerical Methods

Winter 2019

Assignment 2

Submission deadline: Tuesday, 19 Feb 2019, 8:30am (at my office)

1. Lecture Week 3 – pages 7-8:
   Consider the function $f(x) = e^x$ and its derivative $f'(2)$.
   a) Write a Matlab code that computes the relative error $log_{10}\varepsilon$ between the exact value of $f'(2)$ and the approximations given by the forward derivative formula and the central difference formula, respectively.
   b) Plot the results into one graph.
   c) Can you interpret the gradients?
   Hint: Use the command log10 in Matlab and step size $h = 0.1, 0.01, \dots, 10^{-12}$.

2. Lecture Week 3, page 12: Prove the last equation (for $f'(0)$), starting from the first line of equations on the same page.

3. Use the forward derivative formula and the central difference formula to compute $f'(0)$ for $f(x) = x + x^2$. Interpret the results.

4. Problem 1.1, page 15, in textbook
   Hint: For part e), follow the method on page 13. This means that you need to figure out the numbers corresponding to $n = 1,2,3$ in Table 1.1.