Problem Set 1
Numerical Analysis, MATH 3377/6577
Due Wednesday, September 18, 2024

Do the following problems from the text, *Numerical Analysis*, 10th edition, by Burden, Faires and Burden.

Each item is worth 10 points.

1. Section 1.1: 4(b) and 6(c)
2. Section 1.1: 8 and 22
3. Section 1.1: 11
4. Section 1.1: 18
5. MATLAB Exercise: Let $f(x) = (x-1)\ln(x)$ and let $x_0 = 1$.
   a) List the Taylor polynomials $P_1(x)$, $P_2(x), \ldots, P_6(x)$ for f based at x_0.
   b) Make a MATLAB plot of $f(x)$, $P_1(x)$, $P_2(x), \ldots, P_6(x)$ on the same set of axes. Use the interval $(0, 5)$.
   c) Describe the effectiveness of $P_i(x)$, $i = 1, 2, \ldots, 6$ to approximate f on this interval.
6. Section 1.3: 3a and 4
7. Section 1.3: 7a, b
8. Section 2.1: 6c
   a) Use ALG021. Compare the number of iterations needed for convergence using absolute error versus relative error.
   b) Use Theorem 2.1 to find a bound for the number of iterations needed to achieve an approximation of 10^{-5}. Compare this theoretical estimate to the number actually needed.
9. Section 2.1: 13
10. Section 2.2: 14d. Use ALG022.

For Graduate Students:

11. Section 1.1: 27
12. Section 2.2: 19