1. Using four digit arithmetic, add the following numbers, first in ascending order (from smallest to largest) and then in descending order. In doing so round off the partial sums to four significant figures. Compare your results with the correct sum \( x = 0.113731041 \times 10^5 \).

\[
\begin{array}{ccc}
0.1673e+0 & 0.3875e+1 & 0.8053e+3 \\
0.2548e+0 & 0.5478e+2 & 0.8886e+3 \\
0.2997e+1 & 0.7113e+2 & 0.9546e+4 \\
\end{array}
\]

2. Let

\[
f(x) = \frac{\ln(1 + x) - \sin x - \cos x + 1}{x^3}.
\]

Use MATLAB to compute \( f(x) \) for \( x = 10^{-m}, \ m = 1, 2, \cdots, 12 \). According to the theory what is \( \lim_{x \to 0} f(x) \)? For \( x \) near zero what is a better way to compute \( f(x) \)? (Hint: Use Taylor’s theorem on the numerator.)


4. Ex. 1.9, p.23, Shampine, Allen & Preuss.

5. Ex. 1.11, p.24, Shampine, Allen & Preuss. Use MATLAB. In part (a) take \( x = -20 \) and in part (b) take \( x = +20 \). Your first MATLAB command should be “format long”.

6. Ex. 1.13, p.24, Shampine, Allen & Preuss. Show that the first recurrence gives values approaching \( \pi \) but ultimately fails, while you can use the second recurrence to compute \( \pi \) to full precision. (Again, you should be in the “format long” mode.)

7. Ex. 1.15, p.29 Shampine, Allen & Preuss.

8. Ex. 1.16, p.29, Shampine, Allen & Preuss.

9. What is the largest value of \( n \) so that \( n! \) can be exactly represented in a floating point number system where \( (\beta, t, L, U) = (2, 24, -100, 100) \)? Show your work.

10. If 127 is the nearest floating point number to 128 on a base-2 computer, then how long is the mantissa (i.e. what is \( t \))? Show your work.