Basic Numerical Analysis

October 2, 2012

Problem Set 1

1. Write a C program (or in the language of your choice) that evaluates the sum $\sum_{i=1}^{n} n$ and the factorial $n!$ for a given positive integer n.

2. Write a C program that evaluates

$$e^x = 1 + x + \frac{1}{2!}x^2 + \frac{1}{3!}x^3 + ... \tag{1}$$

for a given x. Begin with the second order (up to the x^2 term) and then increase the order. Compare the result with one calculated by pre-defined exp function. That is $exp(x)$ if in C.

3. Write a C program that finds a root of

$$f(x) = e^x - 3x = 0. \tag{2}$$

Newton's method is recommended, but other advanced methods may be used as well.

4. Write a C program that finds all the three (real) roots of

$$f(x) = x^3 + 6x^2 - 24x - 40 = 0. \tag{3}$$

Advanced problem) Write a more general solver that finds the number of real roots and their values for $ax^3 + bx^2 + cx + d = 0$.