MSDM5004
Homework 1 (Part II)

Remarks:

(1) For all problems, write down the formulas and the calculate the results by calculators and **do not** compute it by MATLAB or other software, unless it is specified in the problem that you are required to write a code.

(2) When you are required to write a code, you can use MATLAB or any other programming language.

2. Solve the nonlinear system

$$f_1(x_1, x_2) = 4x_1 + 6x_1^2 + 4x_1^3 - 2x_2 - 2$$
$$f_2(x_1, x_2) = -2x_1 + 2x_2 + 2$$

Write down the iteration algorithm of Newton's method, then perform 2 iterations with the starting point $\mathbf{x}^{(0)} = (0.5, -0.4)^T$. (Use the inverse formula for a 2×2 matrix.)

3. Write a code using MATLAB (or other programming language) to solve the following system using Newton's method

$$f_1(x_1, x_2) = 1 + \frac{1}{4}x_1^2 - x_2^2 + e^{\frac{x_1}{2}} \cos x_2 = 0$$
$$f_2(x_1, x_2) = x_1 x_2 + e^{\frac{x_1}{2}} \sin x_2 = 0$$

Use starting values $x_1^{(0)} = -2$ and $x_2^{(0)} = 4$. Perform 5 iterations.

4. (1) Find the Lagrange interpolating polynomial for these data:

x	-2	0	1
$f(x)$	1	2	0

(2) Find approximation of $f(-1)$ using the interpolating polynomial.

5. Find the least squares polynomial of degree 1 for the data in the table, and compute the error E.

x_i	1.0	1.1	1.3	1.5	1.9	2.1
y_i	1.77	1.89	2.14	2.38	2.87	3.11