Homework 1:

1. **Let**

$$G = \begin{bmatrix} 1 & 2 & 0 & 0 \\ 2 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \\ 0 & 0 & 2 & 1 \end{bmatrix}$$

Please write a program to compute:

(a) The eigenvalues and eigenvectors of G .

(b) The determinant of G .

(c) The column means and row standard deviation of G.

(d) The solution of $Gx = b$, where $b = [1 \quad 2 \quad 3 \quad 4]^t$.

(e) $G^{35} - G^{50} + 12G^4 + 4G^{-8}$.

2. Let

$$f(x) = e^x + 2sin(x), g(x) = 2cos(x) - x^2 + 2, h(x) = log(x) + 2,$$
$$x = 0.1, 0.2, \cdots, 1.$$

Please write a program to plot the three functions with the following requirements:

(a) X-label is "x" while Y-label is "Mathematical functions".

(b) The title of this plot is "Homework 1: Plot 1".

(c) Use 3 different kind of point types for the 3 functions.

(d) Use 3 different kind of lines types for the 3 functions

(e) The legend associated with the 3 functions.

3. Let

$$f(x,y) = \begin{cases} \frac{2}{\sqrt{2\pi}} e^{-x^2/2}, x = -3, -2.99, \cdots, 0 \\ log\left[x^3 - sin\left(\frac{1-2x}{3}\right)\right], x = 1, 1.01, \cdots, 3. \end{cases}.$$

Please write a program to plot the function with the following requirements:

(a) X-label is "x" while Y-label is "Mathematical functions".

(b) The title of this plot is "Homework 1: Plot 2".