Problem 1 Given matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}, b = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$.

If $Ax = b$, calculate $x = [x_1, x_2]$ vector using pseudo inverse method manually.

Problem 2 Given matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} b = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$.

If $Ax = b$, calculate $x = [x_1, x_2]$ vector using SVD method manually.

Problem 3 Use svd method in image compression.

1) Import the $M \times M$ image into MATLAB and covert into gray image. (Use **imread** and **rgb2gray** command)
2) Use **svd** function to extract the singular values of the image.
3) Calculate the summation of all singular values.
4) Take the sum of 10 largest singular values, what is the ratio of this 10 values sum to the total summation?
5) Use these 10 singular values for image reconstruction, what do you get?
6) What about using the 50 largest singular values?
(**Hint**: For (5) image reconstruction, the first N singular value corresponds to a $M \times N$ matrix U, $N \times N$ matrix S, $N \times M$ matrix V, thus the reconstructed image will still be in size $M \times M$)