Practice problem 01

1. Create a 3x3 matrix filled with zeros and then replace the diagonal with ones.

2. Generate a 5x5 matrix with random integers between 10 and 50. Replace all elements greater than 30 with -1.

3. Create a 4x4 matrix with random values and find the indices of the maximum value.

4. Given a matrix, replace all even numbers with their half and all odd numbers with their square.

5. Use `linspace` to generate an array of 20 evenly spaced values between 0 and 100.

6. Create a matrix where each element is the product of its row and column indices.

7. Create a 10x10 matrix where the elements on the boundary are 1 and all other elements are 0.

8. Create two matrices of shape 3x3. Add them together only if their sum is greater than a threshold value of 10.

9. Generate a 1D array of 15 values between 5 and 15 using `linspace`, then reshape it into a 3x5 matrix.

10. Use `meshgrid` to create two 2D arrays representing a grid of x and y coordinates for a grid of size 4x4.

11. Write an if-else statement to check if the determinant of a 2x2 matrix is greater than 0.

12. Generate a matrix with dimensions 6x6, where each element is the sum of its row and column indices.

13. Create a matrix of shape 4x4 where the elements on the diagonal are filled with random values between 1 and 10.

14. Use `linspace` to create a vector of 10 values between -5 and 5, then plot these values against their indices.

15. Create a matrix and perform element-wise multiplication with another matrix of the same dimensions.

16. Write an if-else statement to check if all elements in a 3x3 matrix are positive.

17. Generate a grid of x and y values using `meshgrid` where x ranges from 1 to 5 and y ranges from 10 to 50.

18. Create a matrix of shape 5x5 where the main diagonal is filled with a constant value and all other elements are zero.

19. Use `linspace` to create a 1D array from 0 to 1 with 50 points, then reshape it into a 5x10 matrix.

20. Create a function that takes a matrix and returns a new matrix where all elements greater than the mean of the original matrix are set to 0.