MATLAB Brush Up Course
Practice Set 1

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Problem 1: Basic Concept Exercises

Define two matrices

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}, \quad B = \begin{bmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{bmatrix}$$

Create a script that performs the following operations with them

1. Display the sentence "Do some matrix exercises!"

2. Sum the two matrices

3. Compute their product

4. Compute their product element by element

5. Multiply row 2 in A with column 3 in B

6. Multiply row 1 in A with the transpose of row 1 in B

7. Change entries a_{11} and a_{13} to NaN using one command

8. Replace the lower right 2×2 matrix in B by an identity matrix.

9. What does $B([2:end],[2:end]) = eye(2)$ do?

10. In one command create a 6 x 7 matrix in which all entries in the first three columns take value 1 and in the other columns take value 2.

11. Is the command $[1:0.1:2] * linspace(1,2,10)'$ feasible? Explain.

Problem 2: Matrices

Let $x = 0:0.1:1$. Investigate the following operations:

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1  y = x'*x; % What is the size of y?
2  y = x*x'; % What is the size of y?
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Problem 3: Accessing Subvectors

Let $x = 0 : 0.1 : 1$. Investigate the following operations:

1. A 2×3 matrix x1 which contains the last 6 elements of x.

2. Extract the 1st, 3rd, 4th, 11th elements from x

3. Construct a vector x that contains every element in a even position of x.

Problem 4: Accessing Submatrices

Let

$$A = \begin{bmatrix} 100 & 90 & 80 \\ 70 & 60 & 50 \\ 40 & 30 & 20 \end{bmatrix}$$

Extract the following submatrices from A:

1. a_1 contains column 2

2. a_2 contains row 3

3. a_3 contains rows 2 and 3

4. a_4 contains elements from row 2 to 3 and columns 1 and 3

Problem 5: Matrix Operation

Let $a = pascal(3)$ (containing the binomial coefficients) and $b = [2; 5; 4]$. Find x, where x is the solution s.t. $Ax = b$.

Problem 6: Matrix Properties

Given the following matrix operations in MATLAB:

1. Define a vector $b = [1, 4, 1]$ and sort its elements.

2. Given matrix $B = \begin{pmatrix} 1 & 2 & 3 \\ 6 & 5 & 4 \\ 8 & 7 & 9 \end{pmatrix}$:

   (a) Find the size of matrix B.
   (b) Reshape matrix B into a 1×9 matrix.
   (c) Calculate the sum of the elements of B for each column.
   (d) Determine the minimum and maximum of B.

(e) Compute the determinant and trace of matrix B.

(f) Find the eigenvalues of B.

(g) Determine the rank of matrix B.

(h) Extract the lower and upper triangular parts of B.