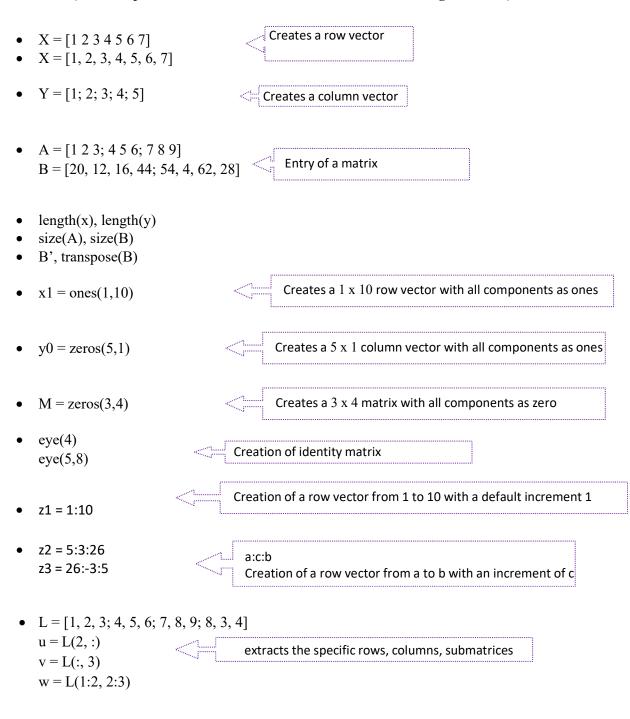
# Amrita School of Engineering, Bengluru-35 23MAT117-Linear Algebra Lab Practice Sheet-1

(Matrix operations, Generation of random matrices with given rank)

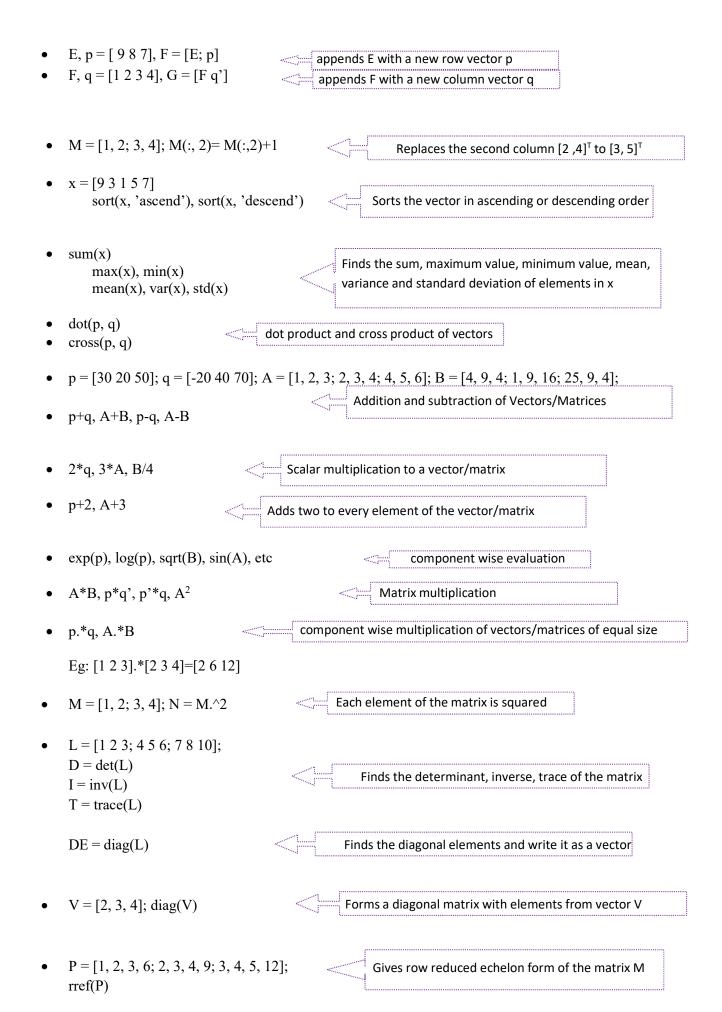


Extracts a specific element from matrix

E = [2, 9, 12; 9, 6, -2; 2, 8, 10]

a = E(2, 3)

b = E(1, 2)



## Rank, Random number/matrix generation, Generation of matrices with given rank

# Generation of random integer matrices with given rank

#### Results used

- 1. Maximum Rank of an  $m \times n$  matrix is min(m, n)
- 2. Rank (AB)  $\leq$  min (Rank(A), Rank(B))

### **Generation of a random symmetric matrix**

- From a random square matrix A = randi([0, 9], 4, 4); S = A+A'
- From a random rectangular matrix

A = randi([0, 9], 4, 2);

S1 = A'\*A; % 2x2 symmetric matrix with rank 2

S2 = A\*A'; % 4x4 symmetric matrix with rank 2

## **Practice Problems:**

- 1. Obtain a random square matrix of order 20 and find the rank of it.
- 2. Obtain 2 random integer square matrices A and B of order 5.
  - (a) Find the rank of A
  - (b) Find the rank of B
  - (c) Find the rank of A+B
  - (d) Find the rank of A-B
  - (e) Find the rank of A\*B
  - (f) Find the rank of kB, by choosing k as any real number
- 3. Generate a 5x5 matrix A of rank 4.
  - (a) Retrieve an element with row index 3, and column index 5.
    - Ans: a = A(3,5)
  - (b) Retrieve first row from A and store in b

Ans: 
$$b = A(1, :)$$

(c) Retrieve first and third row from A and store in C.

Ans: 
$$C = A([1, 3], :)$$

(d) Retrieve second column from A and store in d

Ans: 
$$d = A(:, 2)$$

(e) Retrieve second and fourth column from A and store in E.

Ans: 
$$E = A (:, [2, 4])$$

- 4. Using MATLAB generate a  $9 \times 9$  matrix A of rank 2. Obtain a symmetric matrix B = A + A' and find rank of B.
- 5. Using MATLAB generate a  $10 \times 5$  matrix A of rank 3.
  - (a) Obtain a symmetric matrix  $S1 = A*A^T$  and  $S2 = A^T*A$
  - (b) Find the rank of S1 and S2.