LECTURE 4

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Matrices

- A matrix is an n x m array of numbers which is comprised of n rows and m columns.

- The matrix $A = \begin{bmatrix} 6 & 2 \\ 3 & -5 \end{bmatrix}$ can be entered using the syntax

  >> A = [6, 2 ; 3, -5]

- Write the syntax for entering the matrix

$$B = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 7 & 6 \\ 10 & 12 & 1 \end{bmatrix}$$

Scalar multiplication

```
>> A = [-3 2 ; 6 3]
>> C = 2*A
```

What is the output?

Addition and Subtraction

- Two matrices A and B can only be added or subtracted if they have the same number of rows and columns

```
>> A = [2  3 ; 3  6];
>> B = [4  6; -2  3];
>>  C = A + B

>> D = A - B
```

Transpose of a Matrix

- The transpose of a matrix A is given by A’

Matrix Multiplication

- Given two matrices A and B, if A is an mxp matrix and B is an pxn matrix, then they can be multiplied to produce mxn matrix.

Example

Given $A = \begin{bmatrix} 12 & 3 \\ -1 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 2 \\ 9 & 1 \end{bmatrix}$

```
>> A = [12  3; -1  6];
>> B = [4 2; 9 1];
>> C = A * B
```

1. Write down the commands to enter the following in Matlab

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

2. Calculate A*B and B*A, why are they different

Special Matrix types

Identity matrix

To create an **nxn** identity matrix, the syntax is

eye(n)

Example: eye (5)

Zero matrix

For an **nxn** matrix of zeros, the syntax is

zeros (n)

Example : zeros (4) zeros (m,n)

Special Matrix types cont’

- For matrix with all ones

ones(n)

Examples : ones (m,n)

Referencing Matrix Elements

- Consider the matrix

  >> A = [11 12 13 14; 21 22 23 24; 31 32 33 34];

We can pick out the element at row position m and column position n by typing A(m,n)

Example

>> A (2,3)

ans = 23

- To reference all the elements in the ith column, the syntax is

  A(:,i)

Example

for the 2nd column of A

```
>> A(:,2)
ans =
     12
     22
     32
```

- To select the elements in the ith through the jth column, the syntax is A(:,i:j)

Example:

```
>> A(:,2:3)
ans =
     12   13
     22   23
     32   33
```