Numerical Analysis MTH614

Spring 2012, Korea University

MATLAB basic I
Operations

Assignment and operations

Type name=value Enter

- Scalar

```
>> a = 1    Enter
a = 1
```

- Vectors Indexing

  - Row vector

```
>> b=[1 2 3]  Enter
b = 1     2     3
```

  - Column vector

```
>> b=[1;2;3]  Enter
b = 1
    2
    3
```

- Once a vector has been created, it may be assigned to another vector.

```
>> c=b  Enter
c = 1
    2
    3
```

- And we can transpose it.

```
>> c=b'  Enter
c = 1     2     3
```

- Matrix Indexing

  Now consider indexing into an 3 X 3 matrix A.

```
>> A=[1 2 3;4 5 6;7 8 9]  Enter
A = 1     2     3
    4     5     6
    7     8     9
```

- Similarly we can transpose the matrix A.

```
>> A'  Enter
ans = 1     4     7
      2     5     8
      3     6     9
```

- Matrix operations

  - Matrix multiplication

    A*B

$$AB = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix} = \begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$$

  - Matrix Inverse

    A*inv(B)

$$AB^{-1} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} -4 & 3 \\ 3.5 & 2.5 \end{pmatrix} = \begin{pmatrix} 3 & -2 \\ 2 & -1 \end{pmatrix}$$

  - Element-by-element product

    A .* (B)

$$\begin{pmatrix} 1 \cdot 5 & 2 \cdot 6 \\ 3 \cdot 7 & 4 \cdot 8 \end{pmatrix} = \begin{pmatrix} 5 & 12 \\ 21 & 32 \end{pmatrix}$$

  - Array power

    A .^ (B)

$$\begin{pmatrix} 1^5 & 2^6 \\ 3^7 & 4^8 \end{pmatrix} = \begin{pmatrix} 1 & 64 \\ 2187 & 65536 \end{pmatrix}$$

- Basic commands

  - Special Characters

    , (Comma) : Separates statements and elements in a row.
    …(Ellipsis) : Line-continuation operator.
    ; (Semicolon) : Separates columns and suppresses display.
    %(Percent sign) : Designates a comment.

  - Managing variables

    clc : Clears Command window.
    clf : Deletes from the current figure.
    clear : Removes variables from memory.
    whos : Lists current variables.

- Loop control

- For : The for loop repeats a group of statements a fixed, predetermined number of times. A matching end delineates the statements

For example

```
for x=0:0.5:1
  a=2^x
end
for k=5:-2:1
  b=k
end
```

This example of a for loop where the increment is 0.5 starting from 0 and ending with 1.

This loop where the increment is -2 starting from 5 and ending with 1.

Results

```
a = 1
a = 1.4142
a = 2
b = 5
b = 3
b = 1
```

- if : If conditional statements enable you to select at run time which block of code to execute.

For example

```
a=3; if a<1
    b=a+1
else
    c=a+2
end
```

Results

```
c = 5
```

- while: while loop repeats a group of statements an indefinite number of times under control of a logical condition.

```
a=1;
while a<4
    a=a+1
end
```

Results

```
a =  2
a =  3
a =  4
```

-linspace : The linspace function generates equally spaced vectors.

linspace(a,b,n)

For example

```
x = linspace(0,5,6)
y = linspace(-1,1,5)
```

It generates a vector x of 6 points equally spaced between 0 and 5.
Similarly, y vector of 6 points is generated between -1 and 1.

Results

```
x =   0    1    2    3    4    5
y =  -1  -0.5    0  0.5    1
```

- MATLAB math symbols

  - i , j : Imaginary unit

  For example

```
A = 1+2i
```

  Results

```
A = 1.0000 + 2.0000i
```

  - Inf : Infinity

  For example

```
A = Inf*20000000000
B = Inf/10000000000
C = Inf - Inf
D = Inf / Inf
```

  Results

```
A = Inf
B = Inf
C = NaN
D = NaN
```

- NaN : Not a Number

For example

```
A = 0 / 0
B = Inf / Inf
```

Results

```
A = NaN
B = NaN
```

- Pi, cosine, sine

For example

```
A = pi
B = sin(pi)
C = cos(pi)
```

Results

```
A = 3.1416
B = 1.2246e-016
C = -1
```