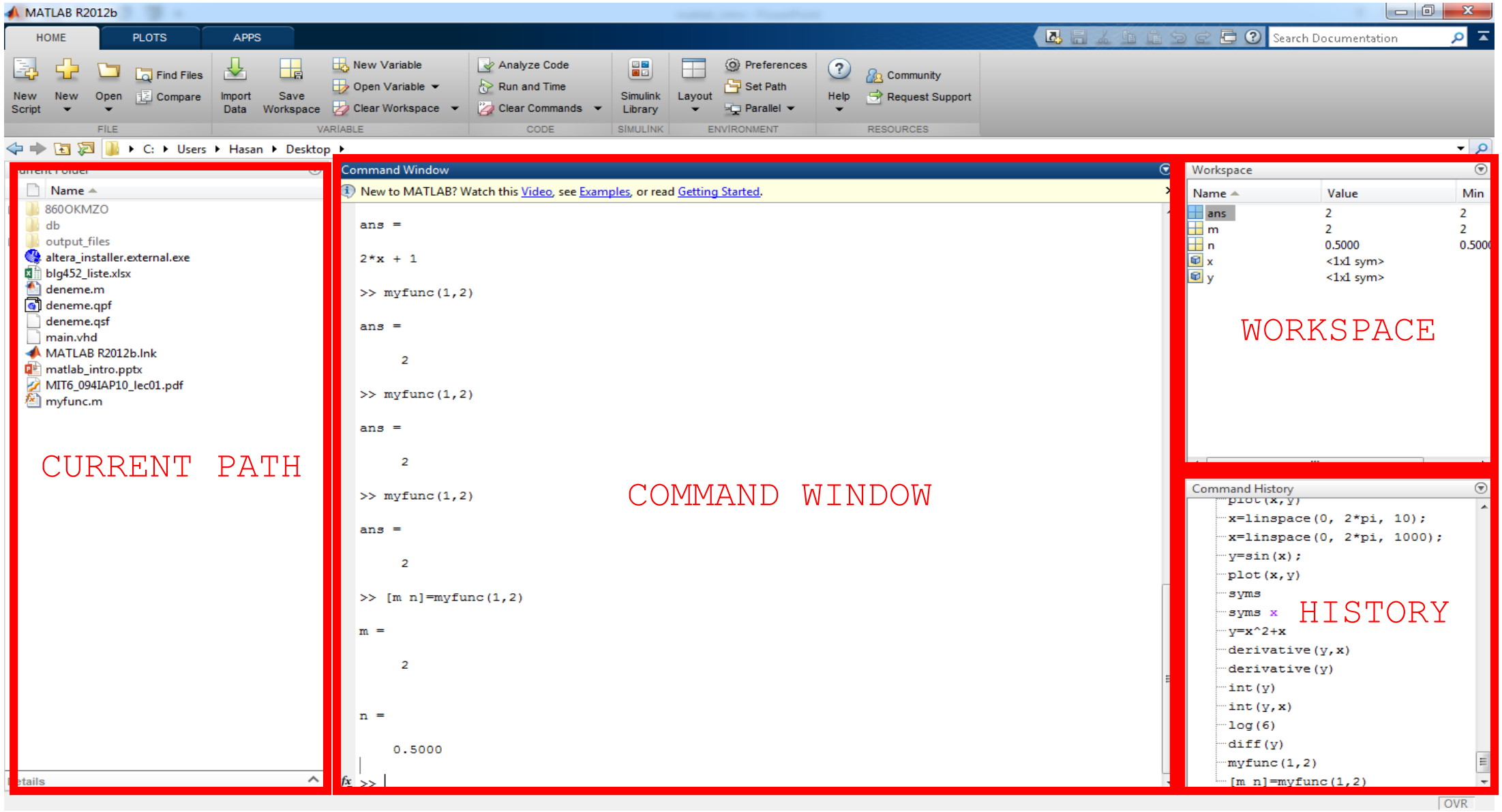
MAT202E

INTRODUCTION TO MATLAB

Outline

- MATLAB Environment
- Variables
- Manipulating Variables
- Basic Plotting
- Script File
- Polynomial Calculation

MATLAB Environment



Variables

```
>> x=12

x =

    12

>> mx=[1 2 3; 4 5 6]

mx =

     1     2     3
     4     5     6

>> mx2=[5; 6; 7]

mx2 =

     5
     6
     7

>> vec=1:0.5:4

vec =

    1.0000    1.5000    2.0000    2.5000    3.0000    3.5000    4.0000
```

```
>> array1=zeros(2)

array1 =

     0     0
     0     0

>> array2=zeros(3,1)

array2 =

     0
     0
     0
```

- Do not use these names!!!

i and **j** indicate complex numbers.

pi has the value 3.1415…

ans stores last result.

Inf is infinity.

NaN represents "Not a Number".

- Accessing array elements

```
>> arr=[ 9 8 7 6 5 4]

arr =

     9     8     7     6     5     4

>> arr(1)

ans =

     9

>> arr(6)

ans =

     4
```

Manipulating Variables

- Scalar operations

```
>> x=12;
>> y=15;
>> x*y

ans =

   180

>> a=(1+i)/(2-i)

a =

   0.2000 + 0.6000i

>> (-2)^4

ans =

    16

>> exp(4)

ans =

   54.5982
```

- Vector operations

```
>> A=[3 2;1 -1]

A =

     3     2
     1    -1

>> B=[-2; 3]

B =

    -2
     3

>> A*B

ans =

     0
    -5

>> A*A

ans =

    11     4
     2     3
```

- Element-wise operation

```
>> vec=[-2 4 6 9]

vec =

    -2     4     6     9

>> vec2=[-1 -4 12 -3]

vec2 =

    -1    -4    12    -3

>> vec.*vec2

ans =

     2   -16    72   -27

>> vec./vec2

ans =

    2.0000   -1.0000    0.5000   -3.0000

>> vec*vec2'

ans =

    31
```

```
>> A.^2

ans =

     9     4
     1     1
```

≠

```
>> A^2

ans =

    11     4
     2     3
```

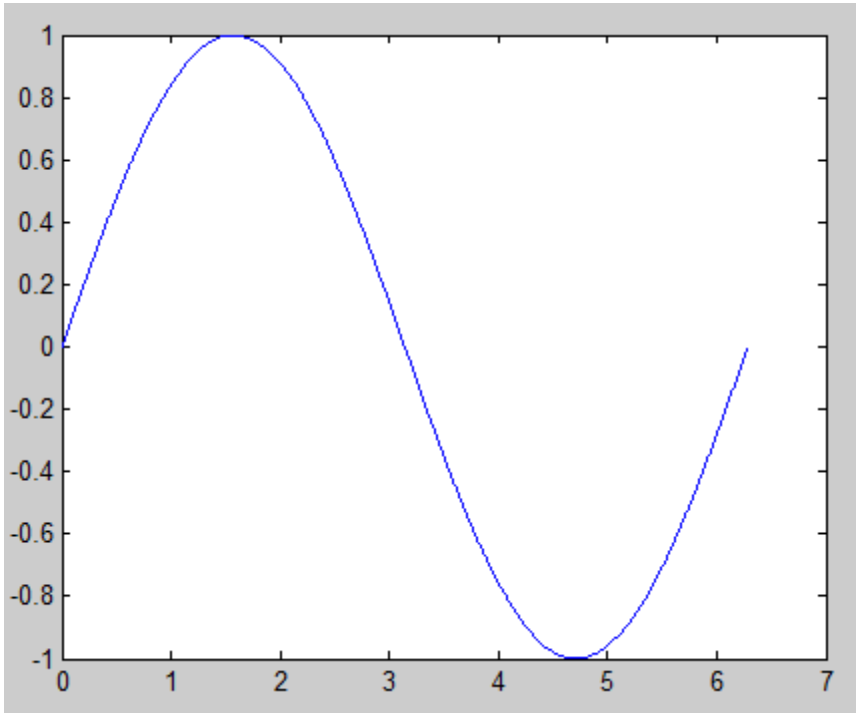
```
>> exp(A)

ans =

   20.0855    7.3891
    2.7183    0.3679

>> [exp(A(1,1)) exp(A(1,2)); exp(A(2,1)) exp(A(2,2))]

ans =

   20.0855    7.3891
    2.7183    0.3679
```

Some Built-in Functions

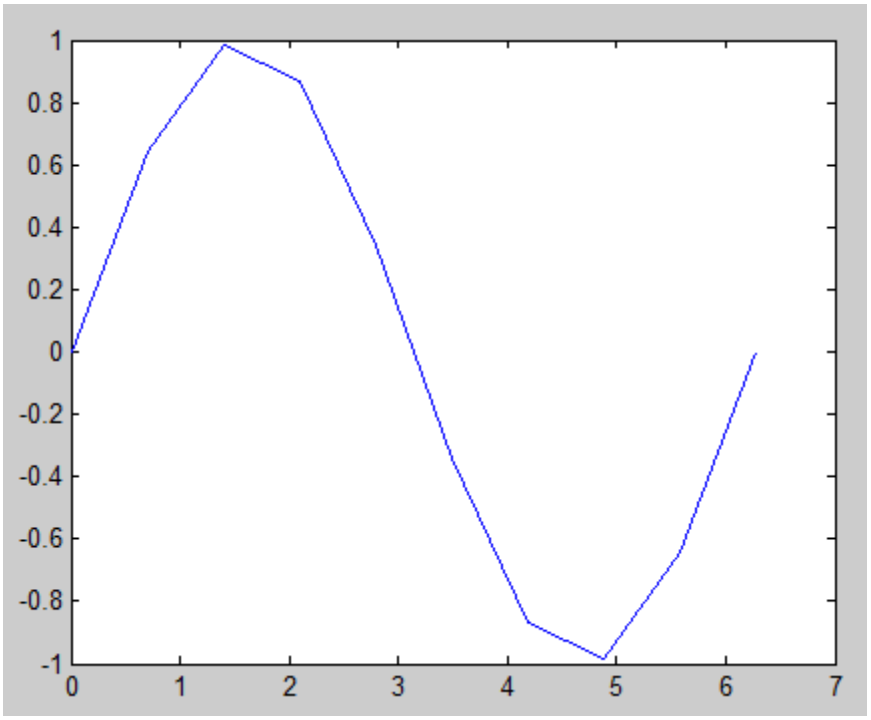
`log(4), sqrt(5), log10(12), floor(2.1), ceil(1.9), abs(2+i)…`

Basic Plotting

```
>> x=linspace(0, 2*pi, 1000);
>> y=sin(x);
>> plot(x,y)
```




```
>> x=linspace(0, 2*pi, 10);
>> y=sin(x);
>> plot(x,y)
```



Script File

myfunc.m

```
1   function [z, t]=myfunc(a,b)
2 -   z=a*b;
3 -   t=a/b;
```

```
>> [m n]=myfunc(1,2)

m =

     2


n =

    0.5000
```

z and **t** are return variables.

a and **b** are input parameters.

Calling **myfunc** from command window or .m file.

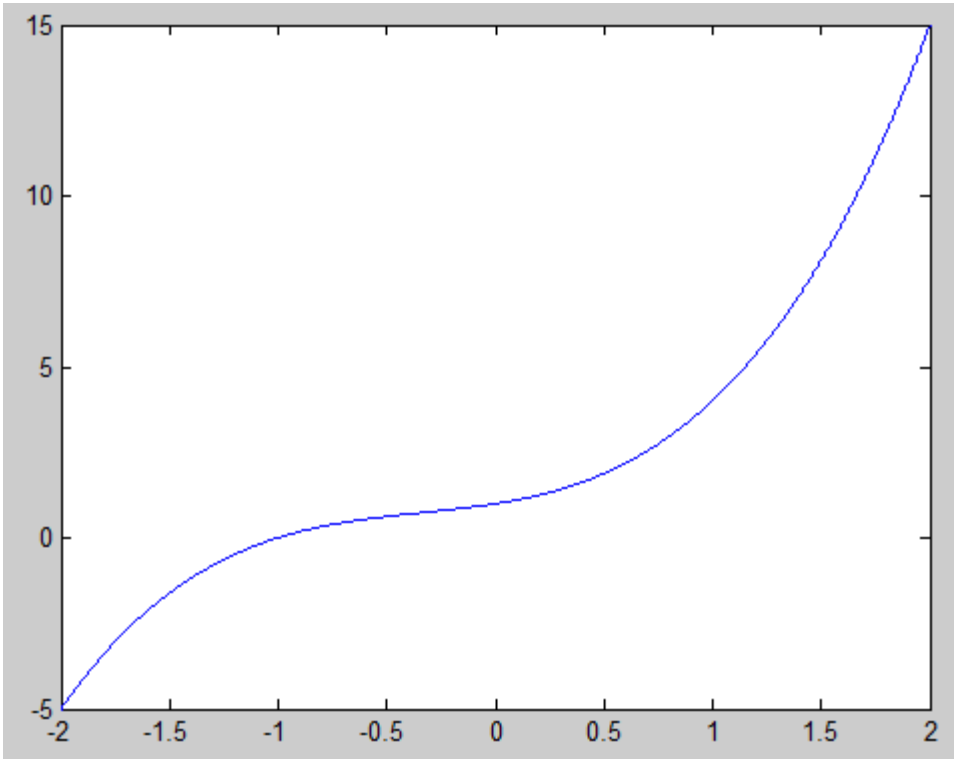
Some Polynomial Calculations

- Derivative and Integral

```
>> syms x
>> y=x^2+3

y =

x^2 + 3

>> int(y, x)

ans =

(x*(x^2 + 9))/3

>> diff(y, x)

ans =

2*x
```

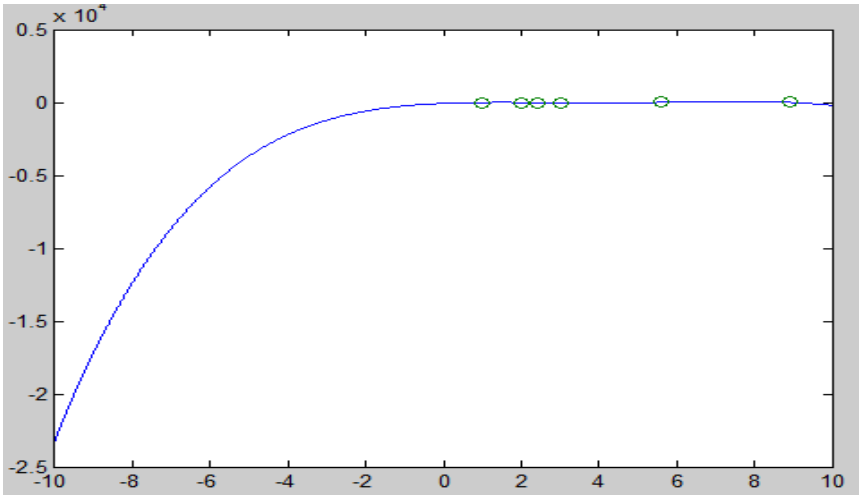
- Simple Plot

```
>> x=-2:0.001:2;
>> y=polyval([1 1 1 1], x);
>> plot(x,y)
```



- Poly Curve Fitting

```
>> a=[1 2 3 2.4 5.6 8.9];
>> b=[-4 -8 -22 -1 3 6];
>> p=polyfit(a,b,4)

p =

   -0.5956   10.4258  -56.9126  108.6773  -66.1274

>> x=-10:0.001:10;
>> y=polyval(p,x);
>> plot(x,y)
>> hold on
>> scatter(a,b)
```



References

- MIT 6.094 Introduction to Programming in MATLAB (ocw.mit.edu)
- MATLAB 2012b Help Guide