

ADDITIONAL MATLAB BASICS

Toby Sanders
Department of Mathematics

BUILT IN FUNCTIONS

- $\{ \sin(x) , \cos(x) , \tan(x) , \csc(x) , \sec(x) , \cot(x) \}$ may all be used in MATLAB. Try typing
`>>sin(0)`

into the command line. Note that the value x should be in radians.

- $\{ \text{asin}(x) , \text{acos}(x) , \dots \}$ are use for $\{ \arcsin(x) , \arccos(x) , \dots \}$ and work in the same way.
- $\log(x)$ is used for $\ln(x)$.
- $\text{size}(x)$ will retrieve the dimensions of the input variable, x .

BUILT IN CONSTANTS

- `pi` is used for π .
- `exp(x)` is used for e^x .

*Note that `pi` is a constant that approximates π in MATLAB. Moreover, functions like sine and cosine are only approximations in MATLAB. So typing

```
>>sin(pi)
```

will not give you exactly 0.

FORMAT SHORT AND FORMAT LONG

- MATLAB's default setting is "format short." In this mode, MATLAB will return 5 significant digits. To obtain more digits, use the "format long" setting. To do this, just type

```
>>format long
```

into the command line.

OPERATIONS WITH MATRICES

```
>> inv(A)
>>transpose(A)
>>A'
```

- Any submatrix of a matrix may be easily extracted. As an example, if A is a matrix, then the command

```
>>B=A(i:j,m:n)
```

will store the submatrix of A containing the i th through j th rows, and m through n th columns. The command

```
>>B = A(:,m:n)
```

will store the m through n columns of A into B (the colon by itself means that getting all of the rows).

- We can multiply matrices in MATLAB with simple commands like

```
>>(A*x)+2*c;
```

- The command

```
>>C=A.*B
```

will give us a new matrix C , where the each entry in C is obtained from the product of the entries in A and B . For example, if

$$A = \begin{bmatrix} 1 & 4 \\ 3 & 0 \end{bmatrix}, B = \begin{bmatrix} -3 & 2 \\ 7 & -1 \end{bmatrix},$$

then typing the command above will give

$$C = \begin{bmatrix} -3 & 8 \\ 21 & 0 \end{bmatrix}.$$

PLOTTING

- Given 2 vectors x and y of the same length

```
>>plot(x,y,'b*')
```

will plot the ordered pairs $(x(1),y(1)), (x(2),y(2)), \dots, (x(n),y(n))$ in blue, with a $*$ for each point. The last command, 'b*', is optional. Without this option, the plot command will plot the ordered pairs in blue and connect the points with lines. Other options than star include

., :, o, x, +, -, *, -. ,--.

- To plot multiple order pairs together, just extend the plot command, for example

```
>>plot(x,y1,'bx', z, y2, 'r', x, y3, 'g+', ... )
```

- The command

```
>>x=linspace(a,b,n)
```

will generate a vector x of dimension n with values $x(i) = a + (b - a) * \frac{i-1}{n}$, i.e. n equally spaced points between a and b . This will be convenient for creating the x -coordinates of the order pairs of your function.

This linspace command is equivalent to

```
>>x = a:(b-a)/(n-1):b
```

which generates a vector x with points between a and b with spacing $(b - a)/(n - 1)$.

HELPFUL TIPS

Pressing "ctrl+c" will kill any function that is currently being executed. The up-arrow in the command line is very useful for recalling previous commands in the command history.