

Quick Summary, Part I

General Commands

<code>exit</code>	Exit Matlab
<code>whos</code>	List all variables and info
<code>ls</code>	List the directory
<code>dir</code>	List the directory
<code>help command</code>	Type the help for command
<code>helpdesk</code>	Invoke the browser help
<code>lookfor keyword</code>	Search help for keyword
<code>diary filename</code>	Save all commands in filename
<code>edit</code>	Invoke the editor
<code>clc</code>	Clear command window

File Input/Output

<code>save filename</code>	Save all as filename.mat
<code>save filename var1</code>	Save var1 as filename.mat
<code>load filename</code>	Load filename.mat
<code>open filename.fig</code>	Load a figure
<code>X=load('file.dat');</code>	Loads text data into X

Arithmetic and Functions

<code>+, -, *, /</code>	Add, Subtract
	Multiply, Divide
Usual Trig Functions	
<code>atan2(y,x)</code>	4-quadrant inverse tangent
<code>exp(A)</code>	e^A , elementwise
<code>log(A)</code>	$\ln(A)$, elementwise
<code>mod(x,y)</code>	See help
<code>randperm(n)</code>	Random permutation of integers 1-n

Array Commands

<code>size,length</code>	
<code>A'</code>	A^T for A real
<code>A.*B</code>	Element multiply
<code>A.^n</code>	Element exponentiate
<code>A./B</code>	Element divide
<code>A*B</code>	Matrix multiply
<code>A+c</code>	Add scalar c to all A .
<code>A*c</code>	Multiply scalar c to all A
<code>A=rand(m,n)</code>	Random matrix
<code>A=randn(m,n)</code>	Random matrix
<code>A=zeros(m,n)</code>	Zero matrix
<code>A=ones(m,n)</code>	Matrix of 1's
<code>A=eye(n)</code>	$n \times n$ identity
<code>a:c</code>	[a a+1 a+2 ... a+m] with $a + m \leq c$
<code>a:b:c</code>	[a a+b a+2b ... a+mb] with $a + mb \leq c$
<code>linspace(a,b,N)</code>	N points between a and b (inclusive)
<code>A(i,j)</code>	The (i,j) th element of A
<code>A(i,:)</code>	The entire i th row
<code>A(:,j)</code>	The entire j th column
<code>A(:,2:5)</code>	The 2d to fifth columns, all rows
<code>A(1:4,2:3)</code>	A 4×2 submatrix
<code>A(1,:)=[];</code>	Delete the first row.
<code>A([1,3],:)=[];</code>	Delete rows 1 and 3.
<code>A(:,3)=[];</code>	Delete column 3.
<code>A(:,1:2:5)=[];</code>	Delete the odd columns.

Plot Example:

```
x=linspace(-2,2);
y1=sin(x);
y2=x.^2;
plot(x,y1,'g*-',x,y2,'k-');
```

```
title('Example One');
legend('The Sine Function','A Quadratic');
xlabel('Dollars');
ylabel('Sense');
```

Code	Color	Symbol	Creates
y	yellow	.	point
m	magenta	o	("oh", not zero) circle
c	cyan	x	x-mark
r	red	+	plus
g	green	—	solid
b	blue	*	star
w	white	:	dotted
k	black	—.	dashdot
		— —	dashed

Also see: `plotyy semilogx semilogy`

Linear Algebra Basics

<code>X=A\B</code>	Solution to $AX=B$ (Exact or Least-squares)
<code>norm(x)</code>	$\ x\ $
<code>[U,S,V]=svd(A)</code>	The Singular Value Decomposition of A
<code>R=rref(A)</code>	Produce the RREF of A
<code>Q=orth(A)</code>	Basis for $\text{Col}(A)$ (columnwise, orthonormal)
<code>N=null(A)</code>	Basis for $\text{Null}(A)$ (columnwise, orthonormal)
<code>[Q,R]=qr(A)</code>	QR factorization $A = QR$, with Q orthog and R upper triangular

Basic Statistics

<code>mean(x)</code>	mean of vector x
<code>mean(X)</code>	mean taken columnwise
<code>std(x)</code>	standard deviation of x
<code>std(X)</code>	stand dev columnwise
<code>hist(a,n)</code>	Histogram of values in vector x using n bins.
<code>hist(A,n)</code>	Histogram (columnwise) of matrix A using n bins
<code>errorbar(m,s)</code>	Error bar plot, m = means s = standard deviations

Bits of useful code

Choose action k with prob $p(k)$

```
P=cumsum([0,p]); %if p is a row
x=rand;
n=histc(x,P);
k=find(n==1);
```

Sort and applications

<code>[vals,idx]=sort(b)</code>	Sorted (lo-hi) values in <code>vals</code> Indices in <code>idx</code>
<code>b(idx(1))</code>	Smallest value of b
<code>b(idx(end))</code>	Biggest value of b
<code>b(idx)</code>	Same as <code>vals</code>
<code>idx1=idx(end:-1:1)</code>	Reverse the index

Maxs/Mins

`a=max(b)` Max of b
`a=max(B)` Max of each column
`a=max(max(B))` Max of B
 Same for min

Use of repmat

`A=repmat(x,a,b)` replicates x a times down and b times across.

1. Example: Mean subtract a matrix X (vectors are columns)

```
[m,n]=size(X);  
x=mean(X');  
X=X-repmat(x',1,n);
```

2. Example: Normalize a matrix X :

```
[m,n]=size(X);  
d=sqrt(sum(X.*X));  
Xnorm=X./repmat(d,m,1);
```

(Note the second line- it computes a vector whose values are the norms of each column of X).

3. Example: Find the column in X closest to a vector a (assume X is $m \times n$ and a is a column)

```
A=X-repmat(a,1,n);  
d=sqrt(sum(A.*A));  
[vals,idx]=sort(d);
```

Then `X(:,idx(1))` is the column closest to a .

Sight and Sound

`image(X)` Display matrix X as an image
`imagesc(X)` Same, but scale the colors
Also see `colormap` and `colorbar`

Movie Example:

```
for k=1:10  
    plot(x,y);  
    M(:,k)=getframe;  
end  
movie(M,3)            Play movie M 3 times
```

Also see `slideshow`

Sounds: See help file for info

```
wavread  
sound  
soundsc
```