MATLAB Basics

Start MATLAB on your machine. You get a prompt like this:

>>

Here are some things you can do.

>> diary on % Causes Matlab to save a record of the session in a
% file named diary. Later you can edit this file,
% print it out, turn it in as homework, or whatever.
% For more information about diary, type ‘‘help diary’’

>> a = [1 2 ; 3 4]

a =

1 2
3 4

>> x = ones(2,1)

x =

1
1

>> b = a*x

b =

3
7

>> y = a\b % Solves system Ay=b for y.

y =

1.0000
1.0000
% transpose

\[ c = a' \]

\[
\begin{bmatrix}
1 & 3 \\
2 & 4 \\
\end{bmatrix}
\]

% upper triangular Cholesky factor

\[
H = a'*a
\]

\[
\begin{bmatrix}
10 & 14 \\
14 & 20 \\
\end{bmatrix}
\]

\[
\text{ans} = \begin{bmatrix}
3.1623 & 4.4272 \\
0 & 0.6325 \\
\end{bmatrix}
\]

\[
m = \begin{bmatrix}
3.1623 & 4.4272 \\
0 & 0.6325 \\
\end{bmatrix}
\]

% exponentiation. Semicolon suppresses printing of result.

\[
A = a^2
\]

\[
\begin{bmatrix}
7 & 10 \\
15 & 22 \\
\end{bmatrix}
\]

\[
A(1,1) = A(1,1) + 13
\]

\[
A = \begin{bmatrix}
20 & 10 \\
15 & 22 \\
\end{bmatrix}
\]

% LU decomposition (with pivoting if necessary)
L =
  
  1.0000  0
  0.7500  1.0000

U =
  
  20.0000  10.0000
  0  14.5000

>> AI = inv(A)

AI =
  
  0.0759  -0.0345
  -0.0517  0.0690

>> p = A*AI

p =
  
  1.0000  0
  0  1.0000

>> format long % some alternative formats
>> p

p =
  
  1.00000000000000  0
  0  1.00000000000000

>> format short e
>> p

p =
  
  1.0000e+00  0
  0  1.0000e+00

>> format           % The default format is called ‘short’.
>> p

3
\[ p = \begin{pmatrix} 1.0000 & 0 \\ 0 & 1.0000 \end{pmatrix} \]

\[ \texttt{>> a = hilb(3)} \quad \% 3 \text{ by } 3 \text{ Hilbert matrix} \]

\[ a = \begin{pmatrix} 1.0000 & 0.5000 & 0.3333 \\ 0.5000 & 0.3333 & 0.2500 \\ 0.3333 & 0.2500 & 0.2000 \end{pmatrix} \]

\[ \texttt{>> b = 1:3} \]

\[ b = \begin{pmatrix} 1 & 2 & 3 \end{pmatrix} \]

\[ \texttt{>> b=b'} \]

\[ b = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \]

\[ \texttt{>> x=a\b} \]

\[ x = \begin{pmatrix} 27.0000 \\ -192.0000 \\ 210.0000 \end{pmatrix} \]

\[ \texttt{>> r=b-a*x} \]
\[ r = 1.0e-14 \] \% scale factor for the array

\[
\begin{bmatrix}
0 \\
-0.7105 \\
0
\end{bmatrix}
\]

\[ \| r \| = 7.1054e-15 \]

\[ \text{cond}(a) \]

\[ \text{ans} = 524.0568 \]

\[ a = \text{zeros}(4,4) \]

\[ a = \begin{bmatrix}
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0
\end{bmatrix} \]

\[ \text{for } i=1:3 \]
  \[ a(i+1,i)=1; \] \% a simple loop
  \[ a(i,i)=2; \] \% The whole thing could have gone on one line.
  \[ a(i,i+1)=3; \]
\[ \text{end} \]

\[ a(4,4)=2; \]

\[ a = \begin{bmatrix}
2 & 3 & 0 & 0 \\
1 & 2 & 3 & 0 \\
0 & 1 & 2 & 3 \\
0 & 0 & 1 & 2
\end{bmatrix} \]
>> quit % Quit MATLAB

% Some other useful commands are:

>> intro

>> demo

>> help

>> help help

>> help elmat

>> help eig

>> help plot

>> help sparse

>> help [name your favorite topic]

% Other commands are less useful:

>> why

% Chances are, you are running a recent version of MATLAB with
% a GUI interface. In this case you can do lots of things using
% the pulldown menus and push buttons. There is also a built-in
% editor.