MATLAB Session 1 Results

The collection of MATLAB statements and screen display:

```
>> x = [1 2 3 4 5 6 7 8 9 10]

x =

     1     2     3     4     5     6     7     8     9    10

>> x = [1 2 3 4 5 6 7 8 9 10];  %Note how the display of result is
suppressed
>> x = x'

x =

     1
     2
     3
     4
     5
     6
     7
     8
     9
    10

>> x = 1:1:10

x =

     1     2     3     4     5     6     7     8     9    10

>> y = 0:0.1:20;
>> size(y)

ans =

     1   201

>> a = [1 2 3 ; 4 5 6 ; 7 8 9]     %To create a matrix

a =

     1     2     3
     4     5     6
     7     8     9

>> p1=[1 -5 4]    %The section on defining and multiplying polynomials

p1 =

     1    -5     4

>> p2=[1 0 4]

p2 =

     1     0     4

>> p3=[1 -5 0]
```

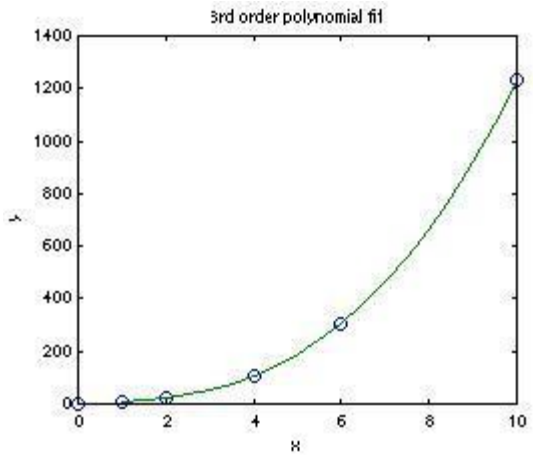
```
p3 =

     1    -5     0

>> p4=[1 3];
>> conv(p1,p4)

ans =

     1    -2   -11    12

>> conv([1 -5 4],[1 3])

ans =

     1    -2   -11    12

>> y1 = 2*x

y1 =

     2     4     6     8    10    12    14    16    18    20

>> y2 = sqrt(x)

y2 =

  Columns 1 through 7

    1.0000    1.4142    1.7321    2.0000    2.2361    2.4495    2.6458

  Columns 8 through 10

    2.8284    3.0000    3.1623

>> b = sqrt(a)    %Further demonstration of array operation using
>>                %the matrix "a" created earlier

b =

    1.0000    1.4142    1.7321
    2.0000    2.2361    2.4495
    2.6458    2.8284    3.0000

>> y3 = y1 + y2

y3 =

  Columns 1 through 7

    3.0000    5.4142    7.7321   10.0000   12.2361   14.4495   16.6458

  Columns 8 through 10

   18.8284   21.0000   23.1623

>> c = a*b

c =
```

```
   12.9373   14.3716   15.6310
   29.8745   33.8078   37.1757
   46.8118   53.2439   58.7203

>> d = a.^3

d =

     1     8    27
    64   125   216
   343   512   729

>> a3 = a^3

a3 =

         468         576         684
        1062        1305        1548
        1656        2034        2412

>> e = a.*b

e =

    1.0000    2.8284    5.1962
    8.0000   11.1803   14.6969
   18.5203   22.6274   27.0000

>> A = [ 4 -2 -10; 2 10 -12; -4 -6 16];
>> b = [-10; 32; -16];
>> x = A\b

x =

    2.0000
    4.0000
    1.0000

>> C = inv(A);
>> x = C*b

x =

    2.0000
    4.0000
    1.0000

>> %You'd only know what LU decomposition means if you have taken
>> %a course on numerical methods. Quickly, it is a method to solve
>> %a linear system of equations.

>> [L,U] = lu(A);
>> x = inv(U)*inv (L)*b

x =

    2.0000
    4.0000
    1.0000

>> [X,D] = eig(A)
```

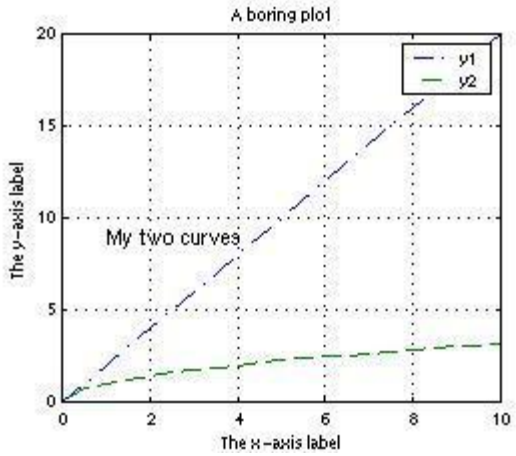
Note:

Please do not be alarmed by the "\" operator; it is just MATLAB's special way to say "solve Ax=b." Like the 3D plots below, it is just an illustration of features available in MATLAB and not what we'll need in later chapters. (We'll clear this up in future editions of the text.)

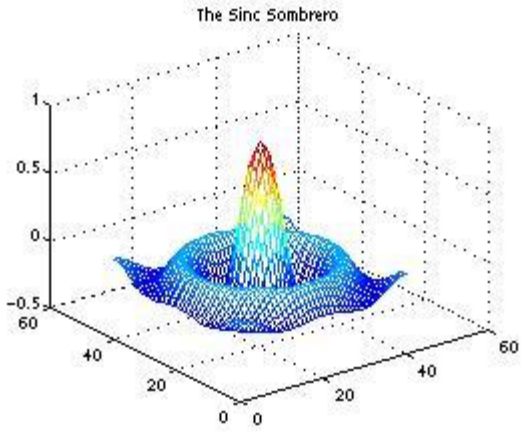
```
X =

    0.9317   -0.2882   -0.7844
    0.1902   -0.6621    0.6174
    0.3095    0.6918    0.0586


D =

    0.2703         0         0
         0   23.4088         0
         0         0    6.3208

>> x = [ 0 1 2 4 6 10];   %The demonstration of polynomial fitting
>> y = [ 1 7 23 109 307 1231];
>> c = polyfit(x,y,3)

c =

    1.0000    2.0000    3.0000    1.0000

>> xfit=1:0.5:10;
>> yfit=xfit.^3 + 2*xfit.^2 + 3*xfit +1;
>> plot(x,y,'o', xfit,yfit)
>> title('3rd order polynomial fit')
>> xlabel('x'), ylabel('y')
```



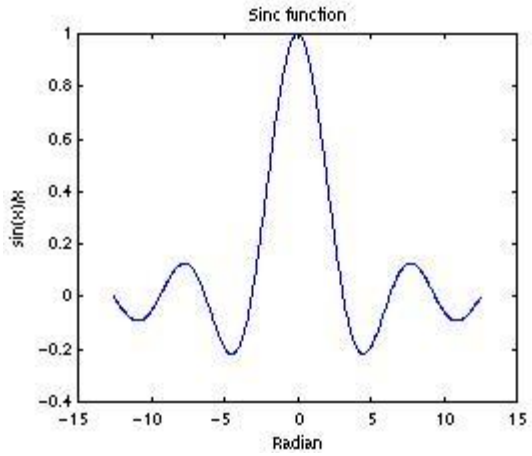

```
>> % Illustration of a few more plotting features
>> x= 0:0.5:10;
>> y1= 2*x;
>> y2= sqrt(x);
>> plot(x,y1,'-.',x,y2,'--')
>> title('A boring plot')
>> xlabel('The x-axis label'), ylabel('The y-axis label')
>> grid
>> legend('y1','y2')
>> text(1,9,'My two curves')
>> % try yourself with the interactive: gtext('My two curves')
```




```
>> % Optional reading from here on -- 3D plotting for fun
>> % Don't worry about the functions that we need to use in this segment.
>> % You won't see and use them again. We just can't help but to
>> % show off some neat MATLAB plotting capabilities.
>> x= -10:0.5:10;
>> y=x';
>> x2=ones(size (y))*x; %ones() generates an array containing all "1"
>> y2=y*ones(size (x));
>> r=sqrt(x2.^2 + y2.^2) + eps; %The addition of "." to the operators does
>> z=sin(r)./r;                 %element-by-element operation to the
arrays.
>> mesh(z)
>> title('The Sinc Sombrero')
```




```
>> x = -4*pi: 0.05: 4*pi;    %The 2-D version
>> y = sin(x)./x;
>> plot(x,y)
>> title('Sinc function')
>> xlabel('Radian')
>> ylabel('sin(x)/x')
```




```
>> %A demonstration of Bessel function calculation and plotting
>>
>> [x,y]=meshgrid(-12:.7:12, -12:.7:12); %Generates a 2D array of points
>> r=sqrt(x.^2+y.^2);
>> z= bessel(0,r);
>> csc=[-45 60];  %Defines our own color scaling vector for mesh()
>> mesh(z,csc)
```