

Matlab Introduction

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Outline

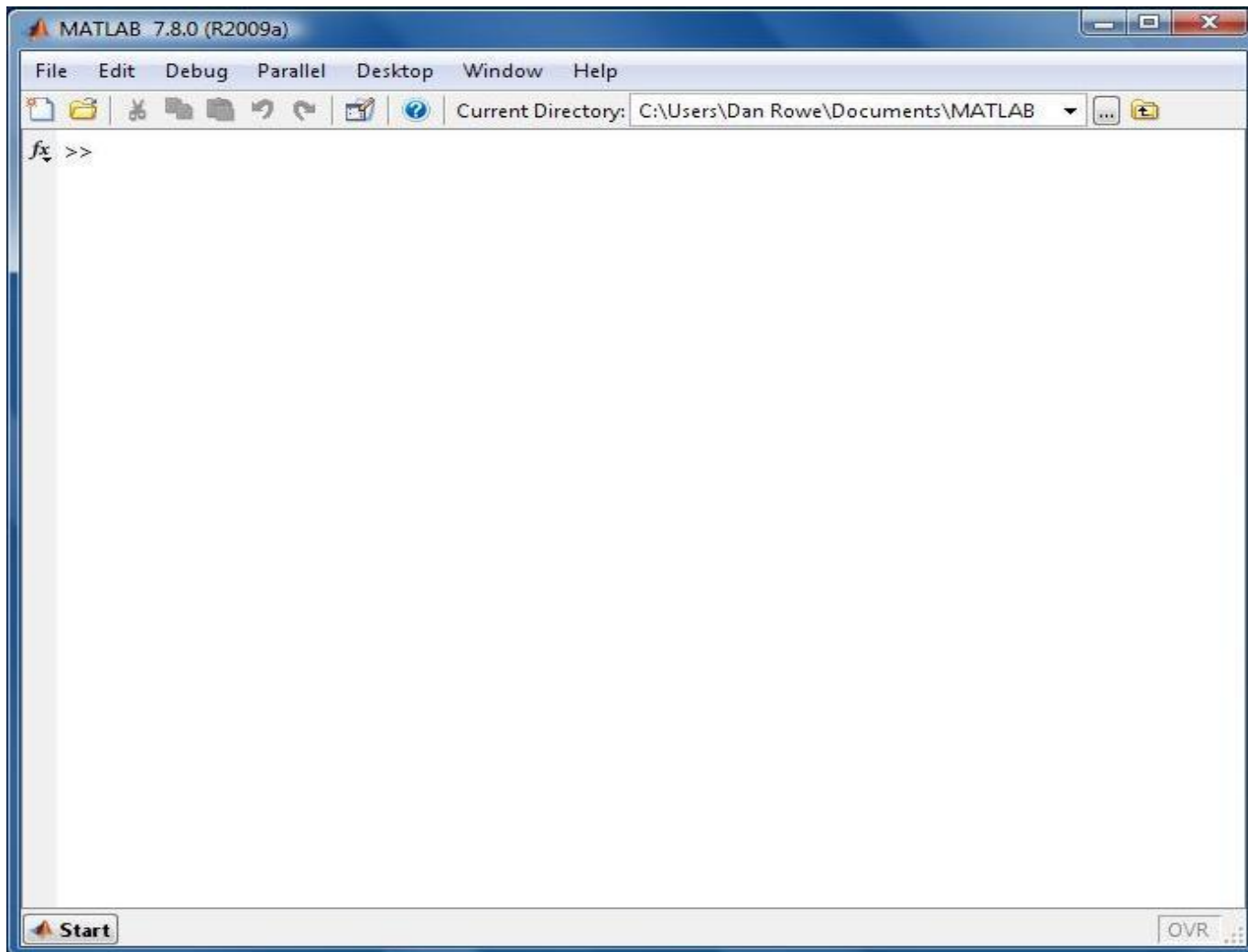
- About Matlab
- Arithmetic and Variables
- Arrays and Indexing
- Programming
- Plotting
- Functions and m-files
- Importing and Exporting
- Images
- Summary

About MATLAB

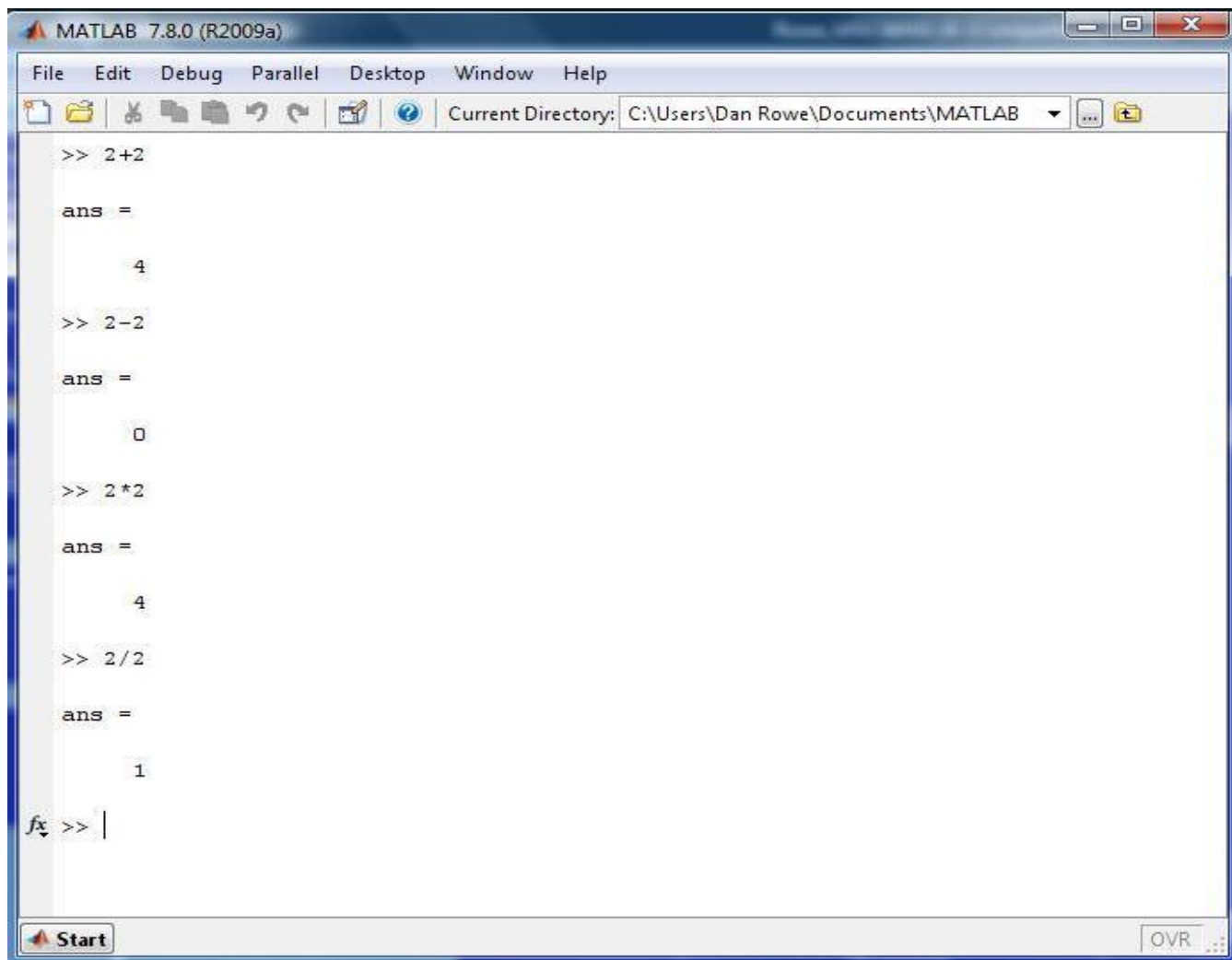
“MATLAB[®] is a high-level language and interactive environment that enables you to perform computationally intensive tasks faster than with traditional programming languages such as C, C++, and Fortran.”

Incredible for piloting and development!

About MATLAB



Arithmetic and Variables

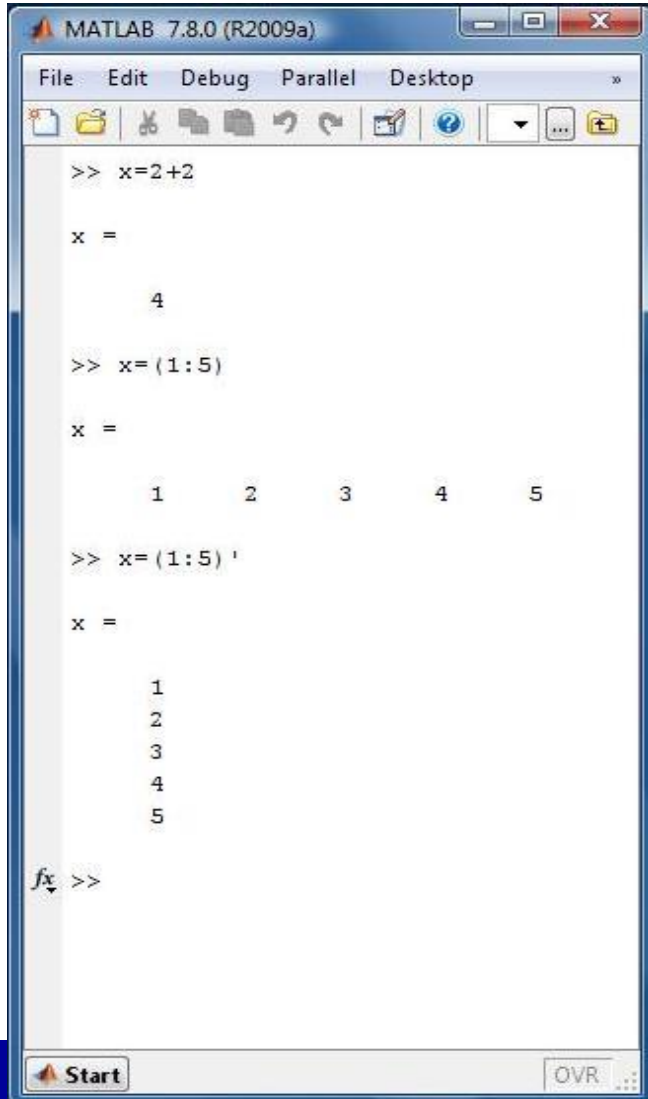


The image shows a screenshot of the MATLAB 7.8.0 (R2009a) command window. The window title is "MATLAB 7.8.0 (R2009a)". The menu bar includes "File", "Edit", "Debug", "Parallel", "Desktop", "Window", and "Help". The current directory is "C:\Users\Dan Rowe\Documents\MATLAB". The command window contains the following text:

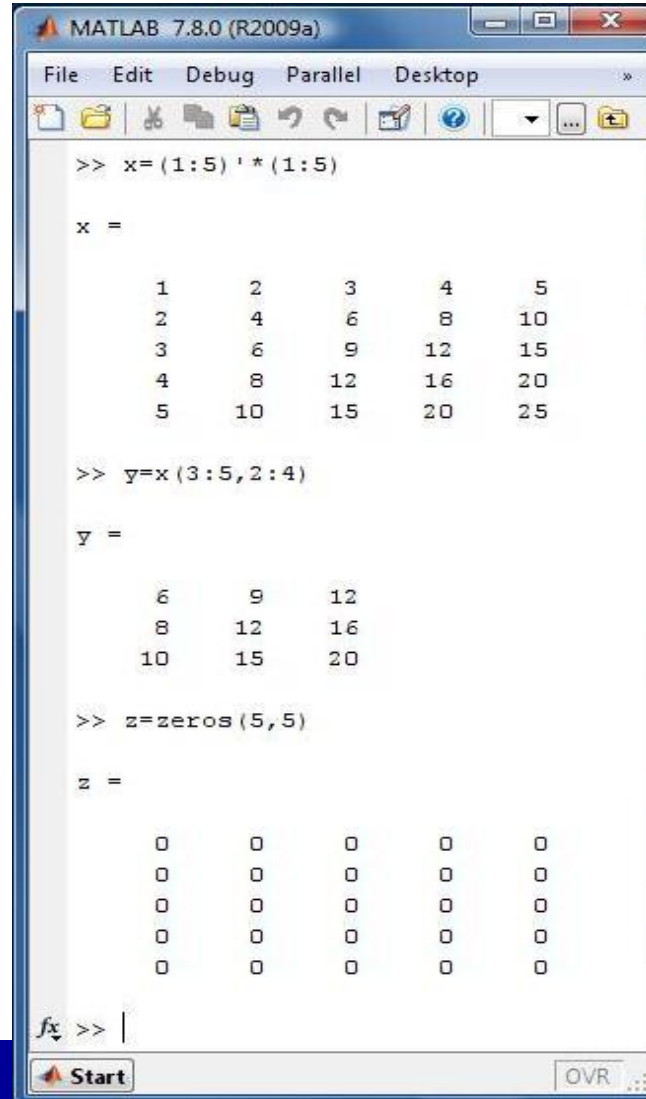
```
>> 2+2  
ans =  
    4  
>> 2-2  
ans =  
    0  
>> 2*2  
ans =  
    4  
>> 2/2  
ans =  
    1  
fx >> |
```

The window also shows a "Start" button in the bottom left corner and an "OVR" indicator in the bottom right corner.

Arrays and Indexing

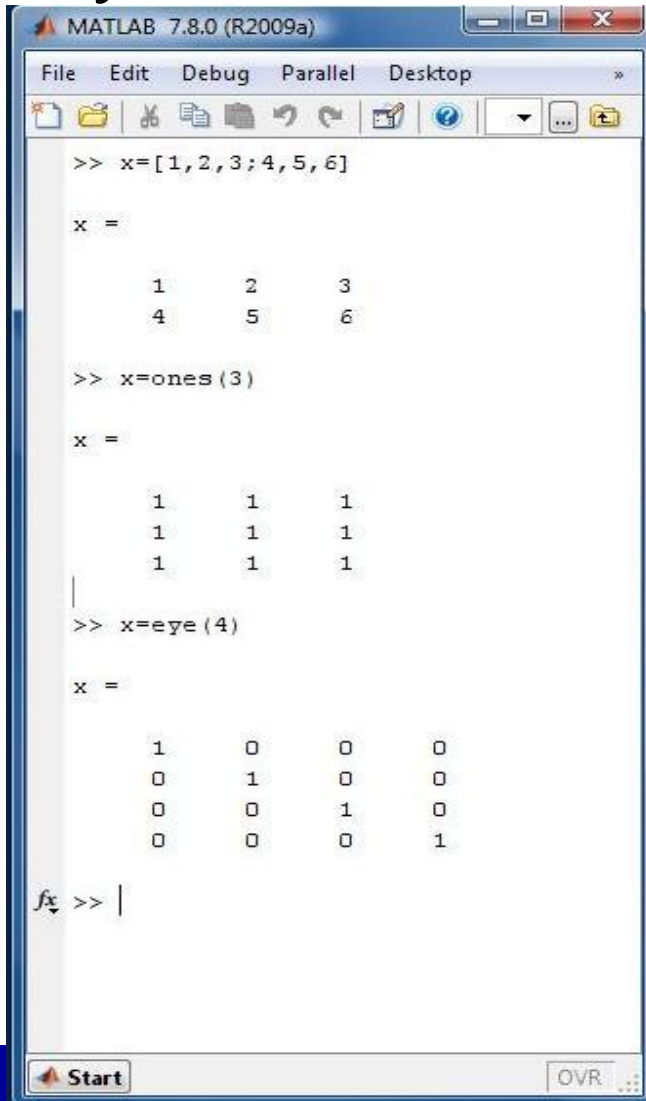


```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop
>> x=2+2
x =
    4
>> x=(1:5)
x =
    1    2    3    4    5
>> x=(1:5) '
x =
    1
    2
    3
    4
    5
fx >>
```

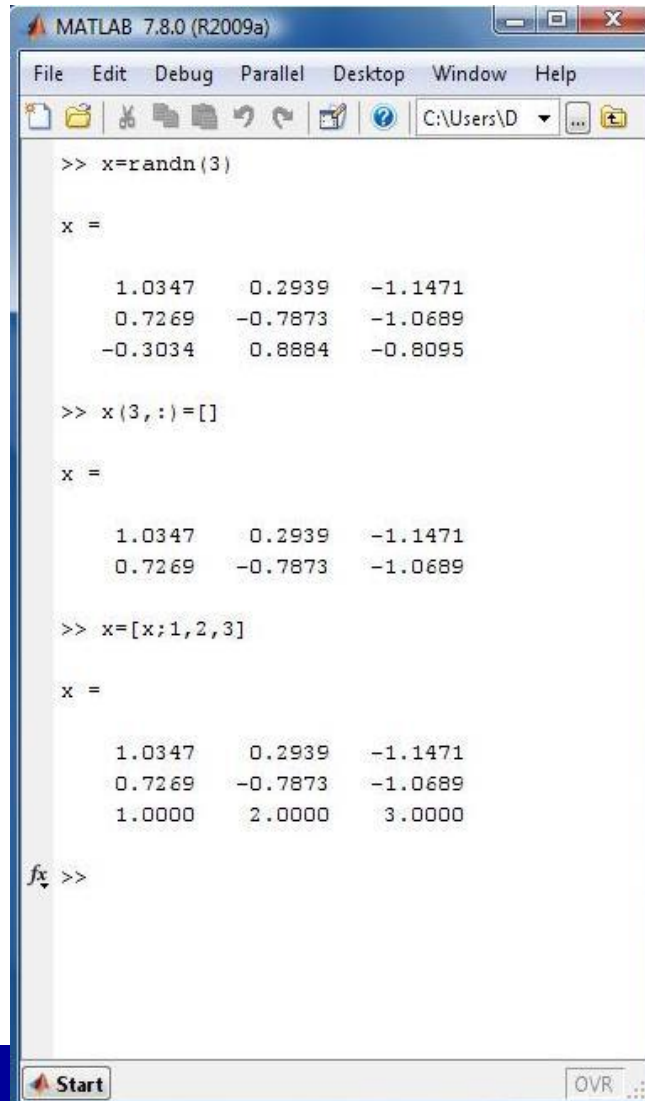


```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop
>> x=(1:5) ' * (1:5)
x =
    1    2    3    4    5
    2    4    6    8   10
    3    6    9   12   15
    4    8   12   16   20
    5   10   15   20   25
>> y=x(3:5,2:4)
y =
    6    9   12
    8   12   16
   10   15   20
>> z=zeros(5,5)
z =
    0    0    0    0    0
    0    0    0    0    0
    0    0    0    0    0
    0    0    0    0    0
    0    0    0    0    0
fx >>
```

Arrays and Indexing



```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop
>> x=[1,2,3;4,5,6]
x =
     1     2     3
     4     5     6
>> x=ones(3)
x =
     1     1     1
     1     1     1
     1     1     1
>> x=eye(4)
x =
     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1
fx >> |
```



```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop Window Help
C:\Users\D
>> x=randn(3)
x =
     1.0347     0.2939    -1.1471
     0.7269    -0.7873    -1.0689
    -0.3034     0.8884    -0.8095
>> x(3,:)=[]
x =
     1.0347     0.2939    -1.1471
     0.7269    -0.7873    -1.0689
>> x=[x;1,2,3]
x =
     1.0347     0.2939    -1.1471
     0.7269    -0.7873    -1.0689
     1.0000     2.0000     3.0000
fx >>
```

Arithmetic and Variables

Matrix Operations:

$+$, $-$, $*$, $/$, $\text{sqrt}()$, $\text{sin}()$, $\text{det}()$, $\text{eig}()$, $\text{rank}()$, ...

Element Operations:

$.$, $./$, $.^2$, $A.*B$, $A./B$, ...

Programming

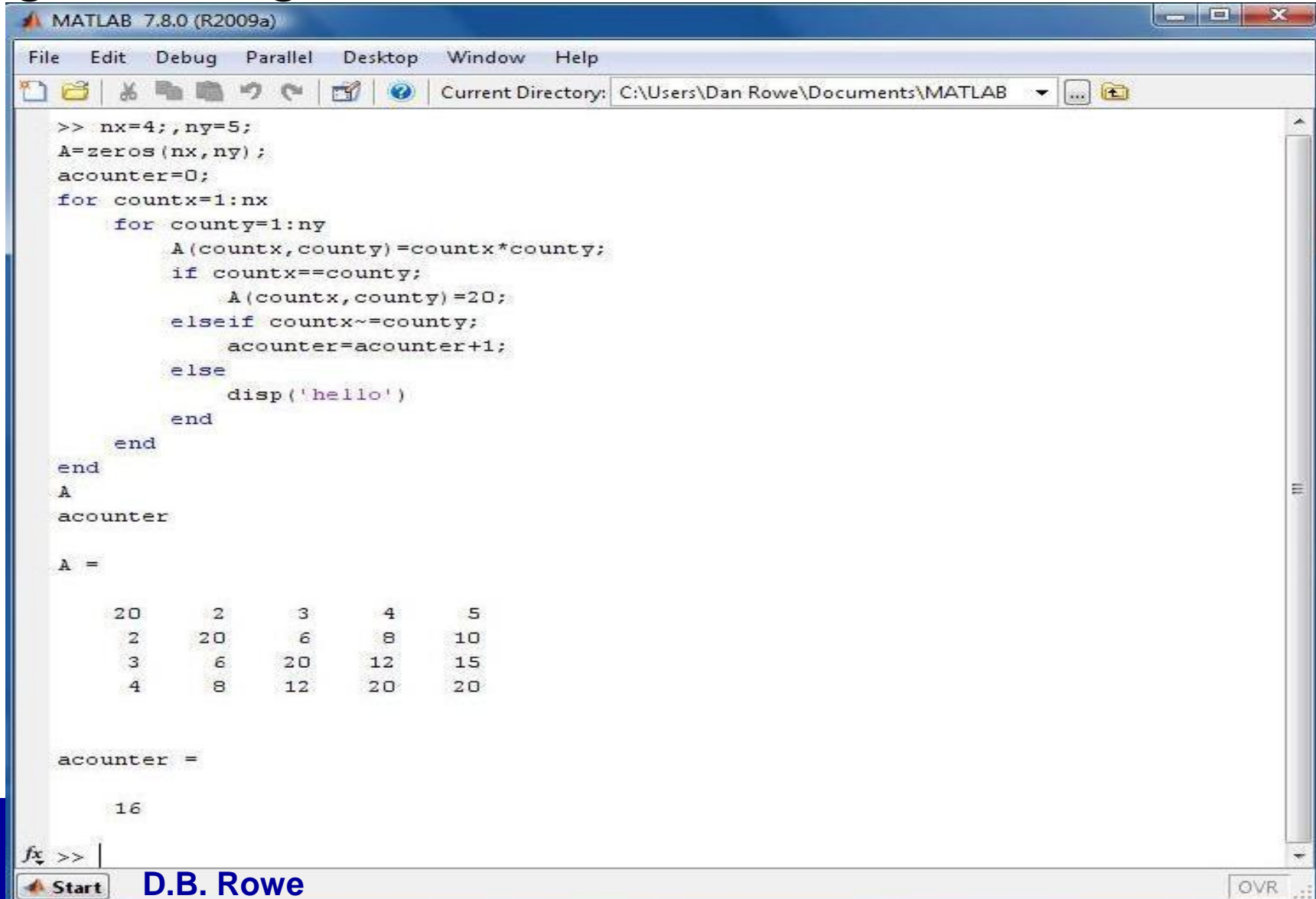
```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop Window Help
Current Directory: C:\Users\Dan Rowe\Documents\MATLAB
>> n=10;
x=zeros(n,1);
for count=1:n
    x(count,1)=count^2;
end
x'

ans =

    1     4     9    16    25    36    49    64    81   100

fx >>
```

Programming



```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop Window Help
Current Directory: C:\Users\Dan Rowe\Documents\MATLAB
>> nx=4; ny=5;
A=zeros(nx,ny);
acounter=0;
for countx=1:nx
    for county=1:ny
        A(countx,county)=countx*county;
        if countx==county;
            A(countx,county)=20;
        elseif countx~=county;
            acounter=acounter+1;
        else
            disp('hello')
        end
    end
end
A
acounter

A =

    20     2     3     4     5
     2    20     6     8    10
     3     6    20    12    15
     4     8    12    20    20

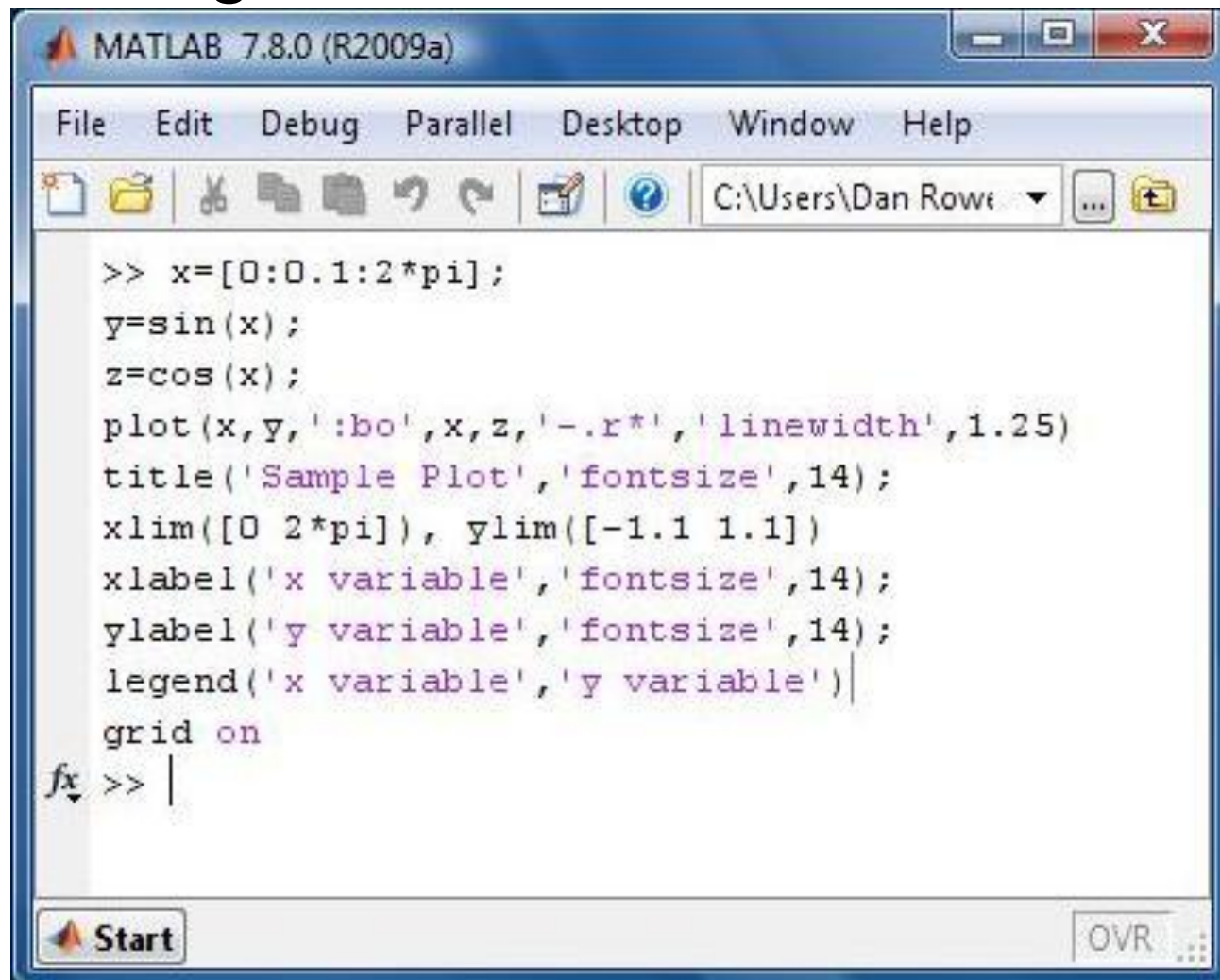
acounter =

    16
```

fx >> |

Start D.B. Rowe OVR

Plotting

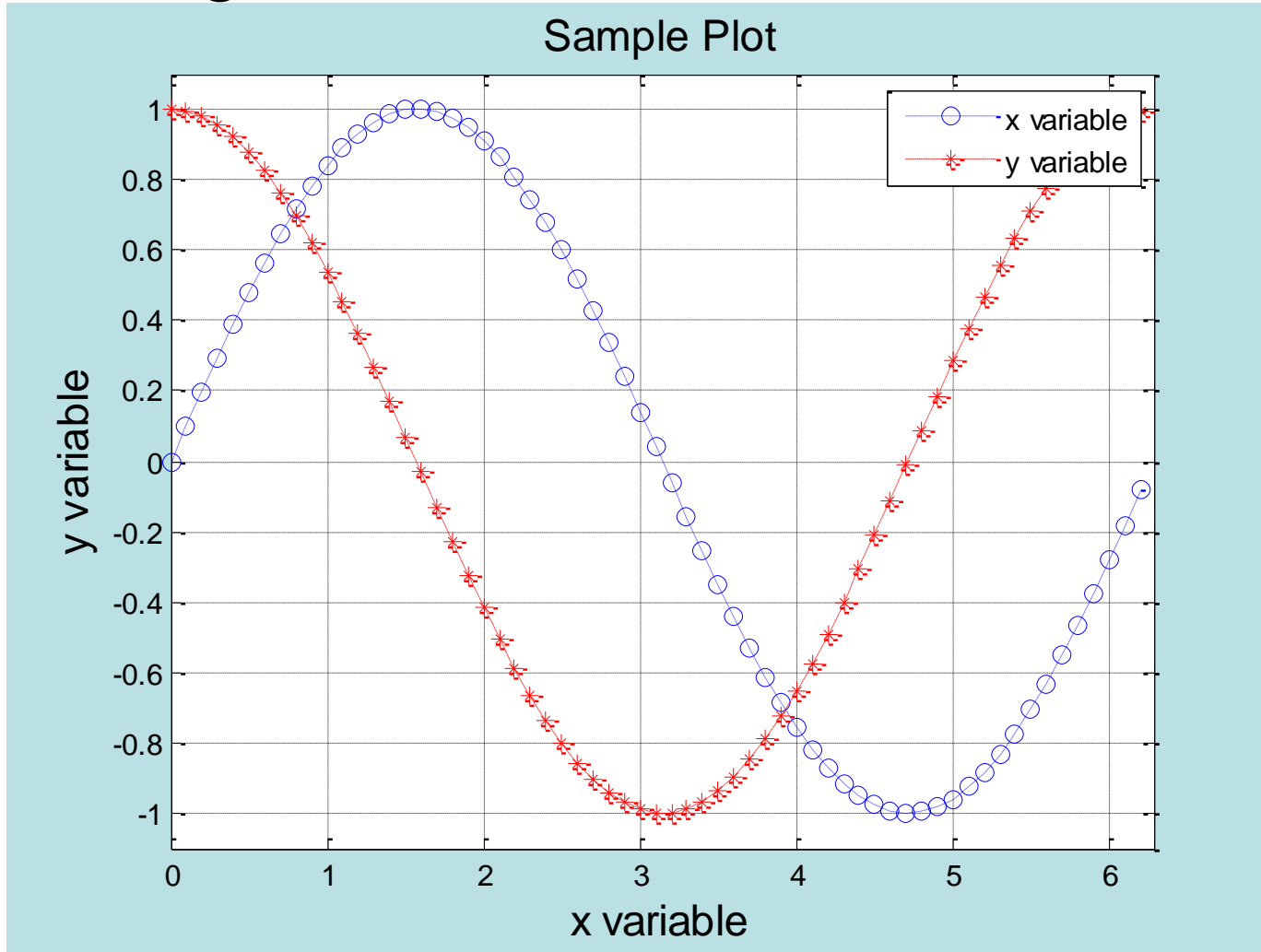


The image shows a MATLAB 7.8.0 (R2009a) window with a menu bar (File, Edit, Debug, Parallel, Desktop, Window, Help) and a toolbar. The command window contains the following code:

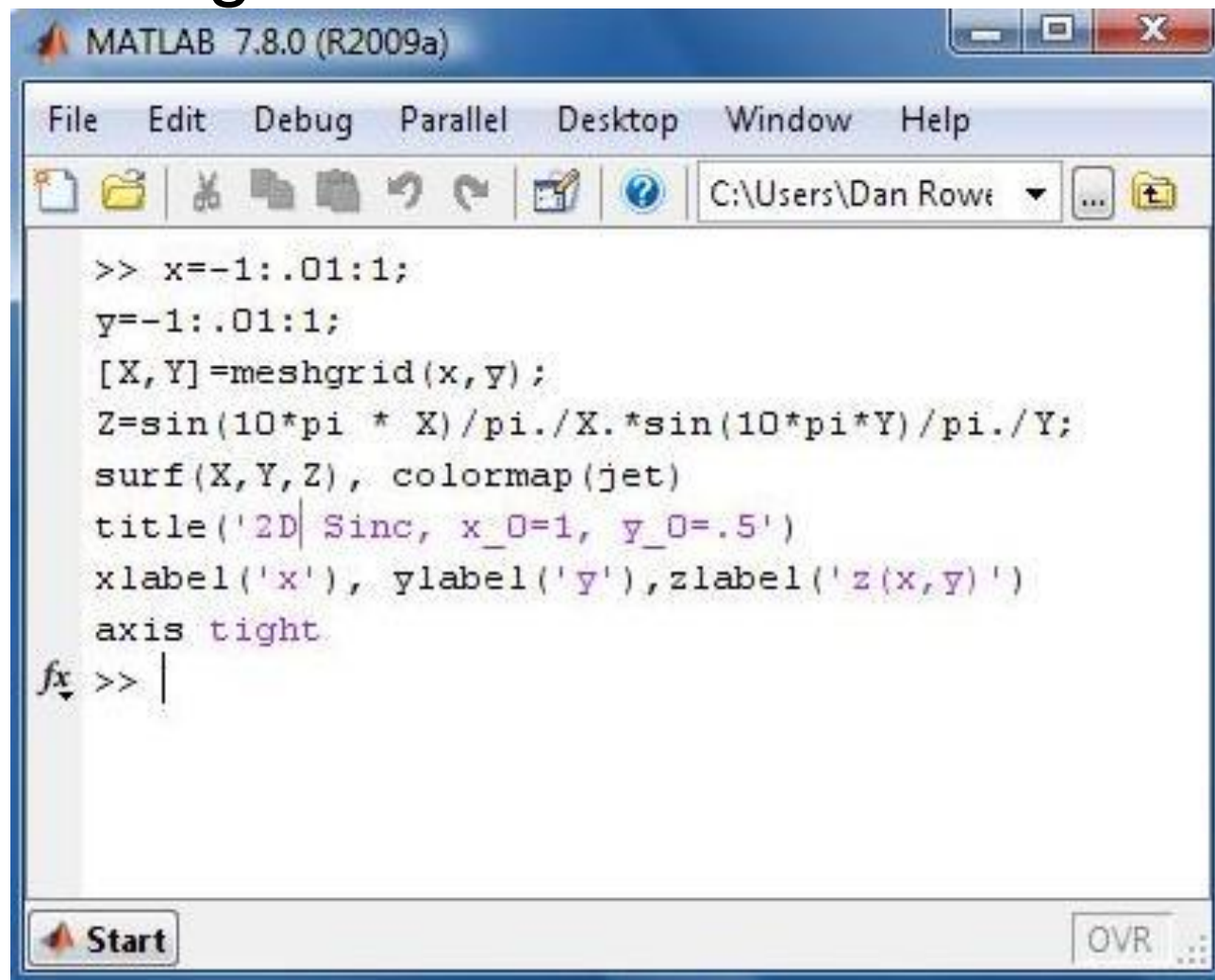
```
>> x=[0:0.1:2*pi];  
y=sin(x);  
z=cos(x);  
plot(x,y,':bo',x,z,'-.r*','linewidth',1.25)  
title('Sample Plot','fontsize',14);  
xlim([0 2*pi]), ylim([-1.1 1.1])  
xlabel('x variable','fontsize',14);  
ylabel('y variable','fontsize',14);  
legend('x variable','y variable')  
grid on  
fx >> |
```

The window title bar reads "MATLAB 7.8.0 (R2009a)". The status bar at the bottom left shows a "Start" button and the system tray shows "OVR" and a mouse cursor.

Plotting - 2D



Plotting - 2D

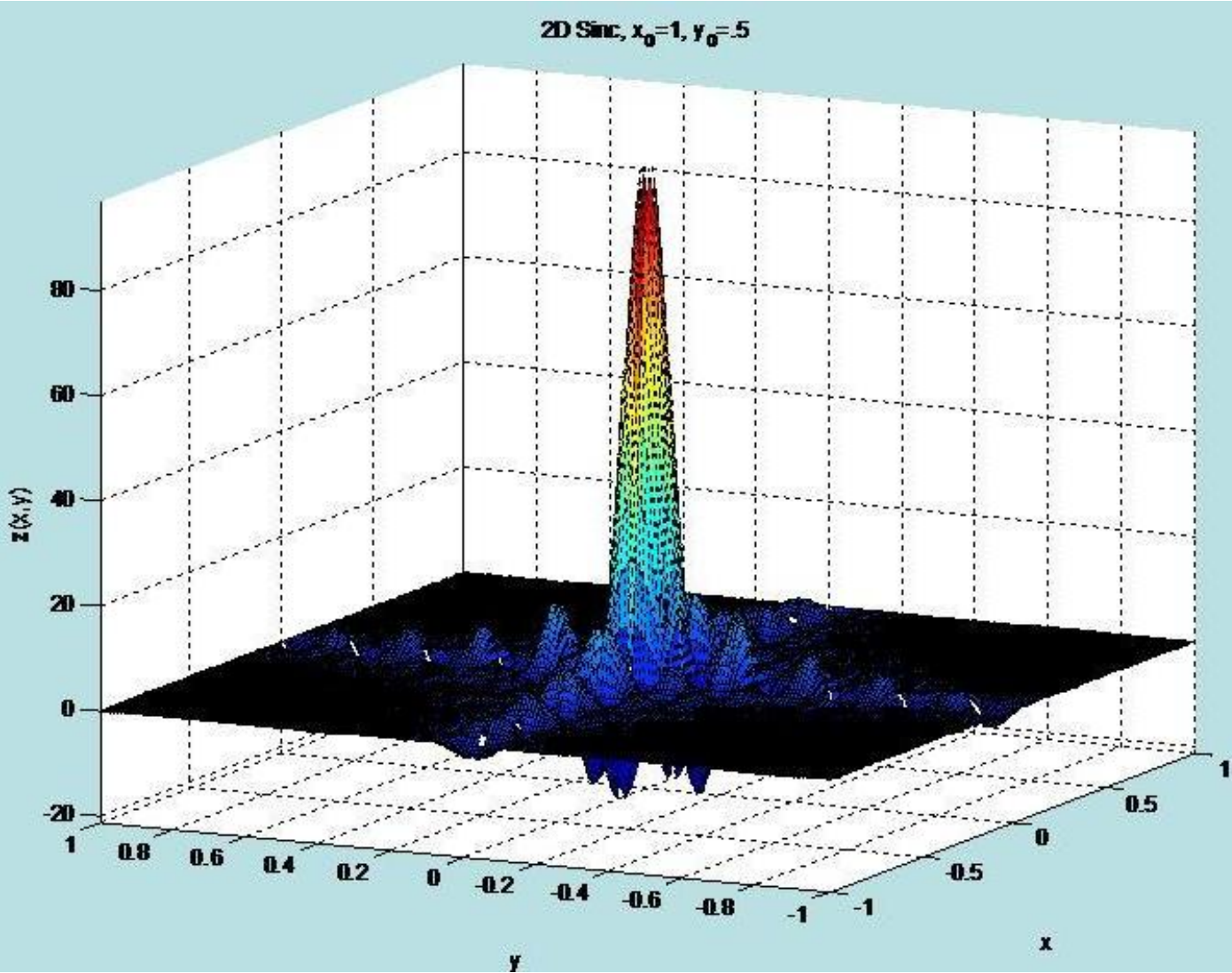


The image shows a MATLAB 7.8.0 (R2009a) window with a command window containing the following code:

```
>> x=-1:.01:1;
y=-1:.01:1;
[X,Y]=meshgrid(x,y);
Z=sin(10*pi * X)/pi./X.*sin(10*pi*Y)/pi./Y;
surf(X,Y,Z), colormap(jet)
title('2D Sinc, x_0=1, y_0=.5')
xlabel('x'), ylabel('y'), zlabel('z(x,y)')
axis tight.
```

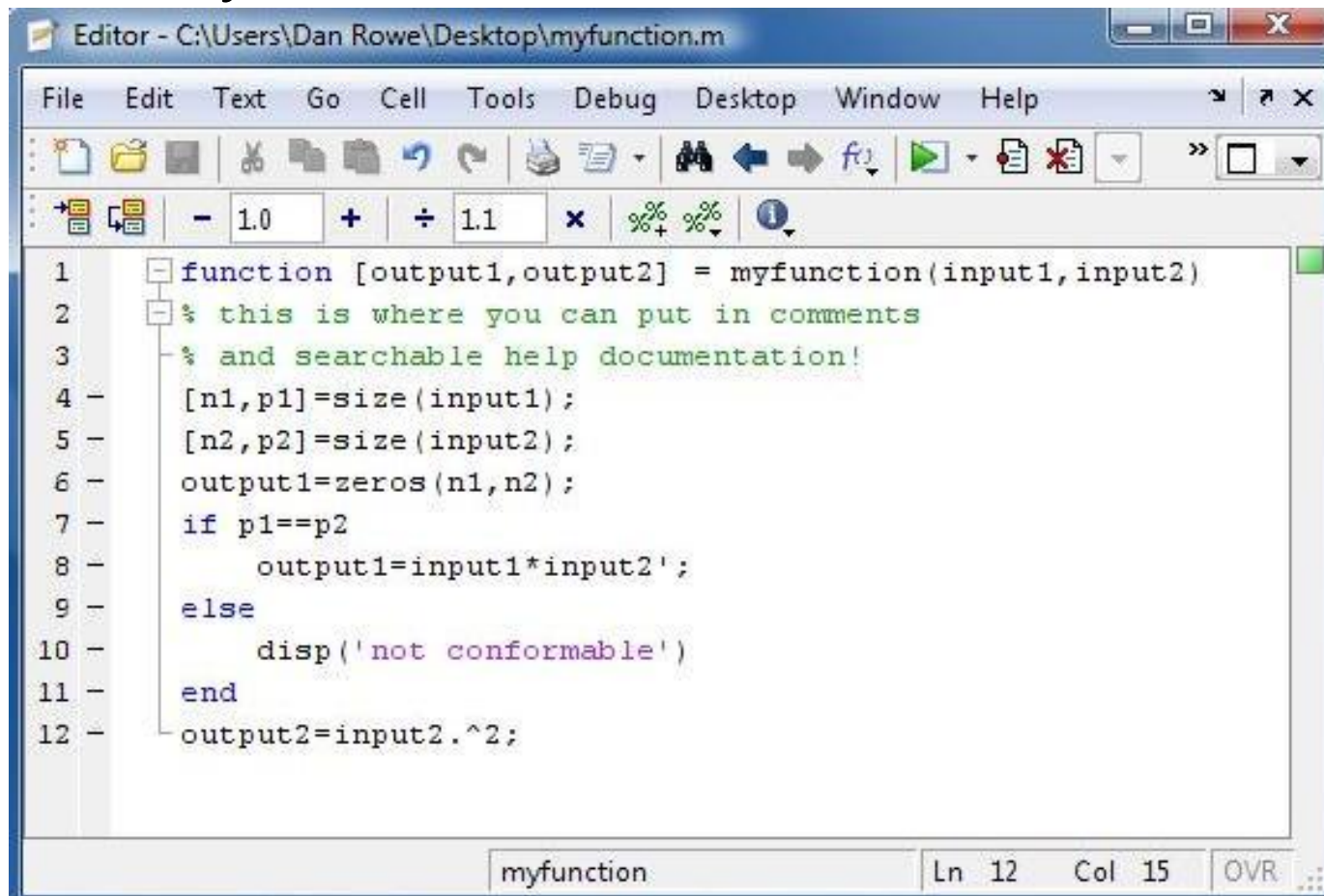
The plot is a 2D surface plot of a sinc function, showing a central peak at (0,0) and a grid of smaller peaks and valleys. The plot is titled '2D Sinc, x_0=1, y_0=.5' and has axes labeled 'x', 'y', and 'z(x,y)'. The plot is displayed using the 'jet' colormap. The window title is 'MATLAB 7.8.0 (R2009a)' and the file path is 'C:\Users\Dan Rowe'. The window also shows a 'Start' button and an 'OVR' indicator.

Plotting - 3D



Functions and m-files

Create your own functions!



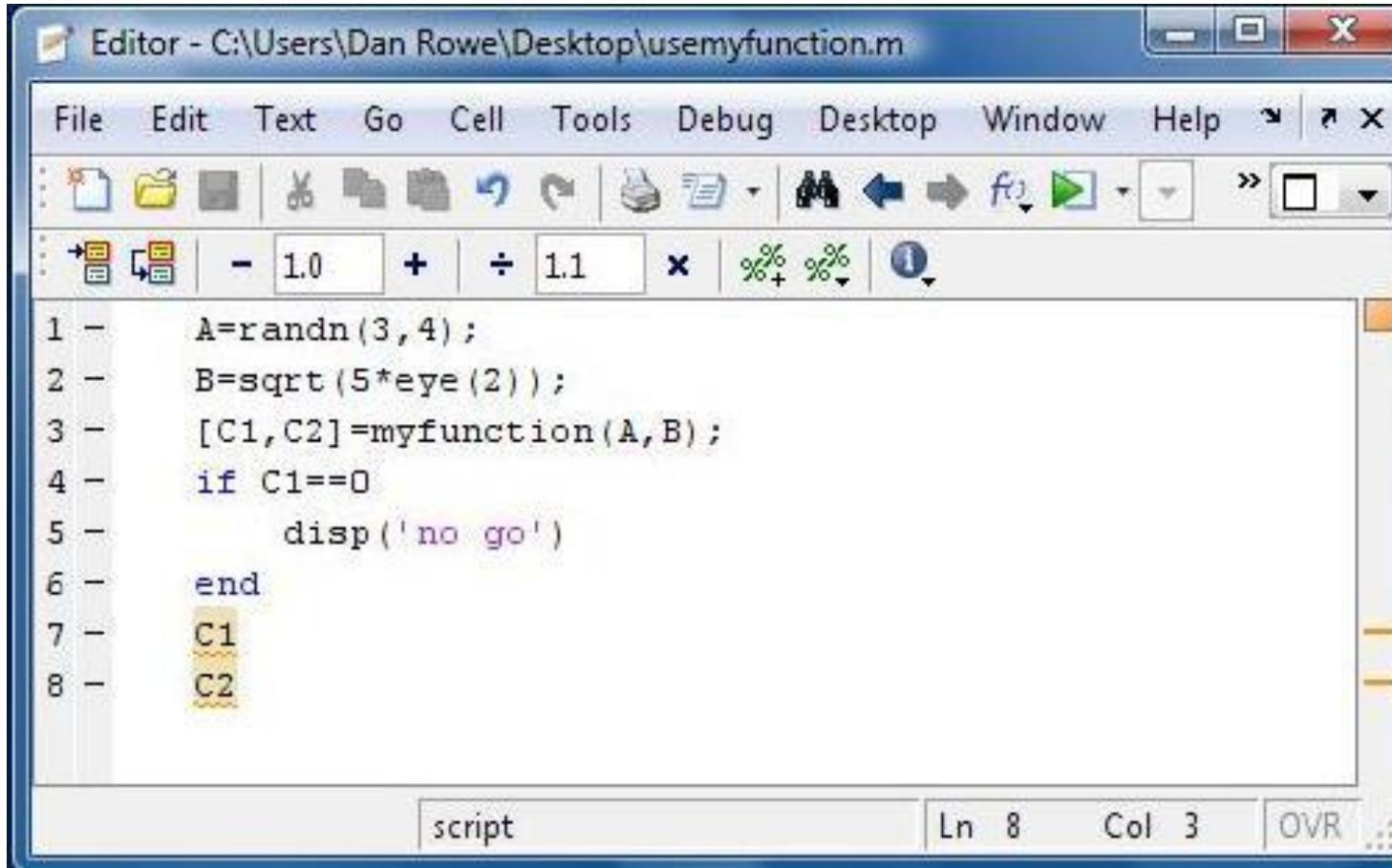
The screenshot shows a MATLAB Editor window titled "Editor - C:\Users\Dan Rowe\Desktop\myfunction.m". The window contains the following code:

```
1 function [output1,output2] = myfunction(input1,input2)
2 % this is where you can put in comments
3 % and searchable help documentation!
4 - [n1,p1]=size(input1);
5 - [n2,p2]=size(input2);
6 - output1=zeros(n1,n2);
7 - if p1==p2
8 -     output1=input1*input2';
9 - else
10 -     disp('not conformable')
11 - end
12 - output2=input2.^2;
```

The status bar at the bottom of the window shows "myfunction", "Ln 12", "Col 15", and "OVR".

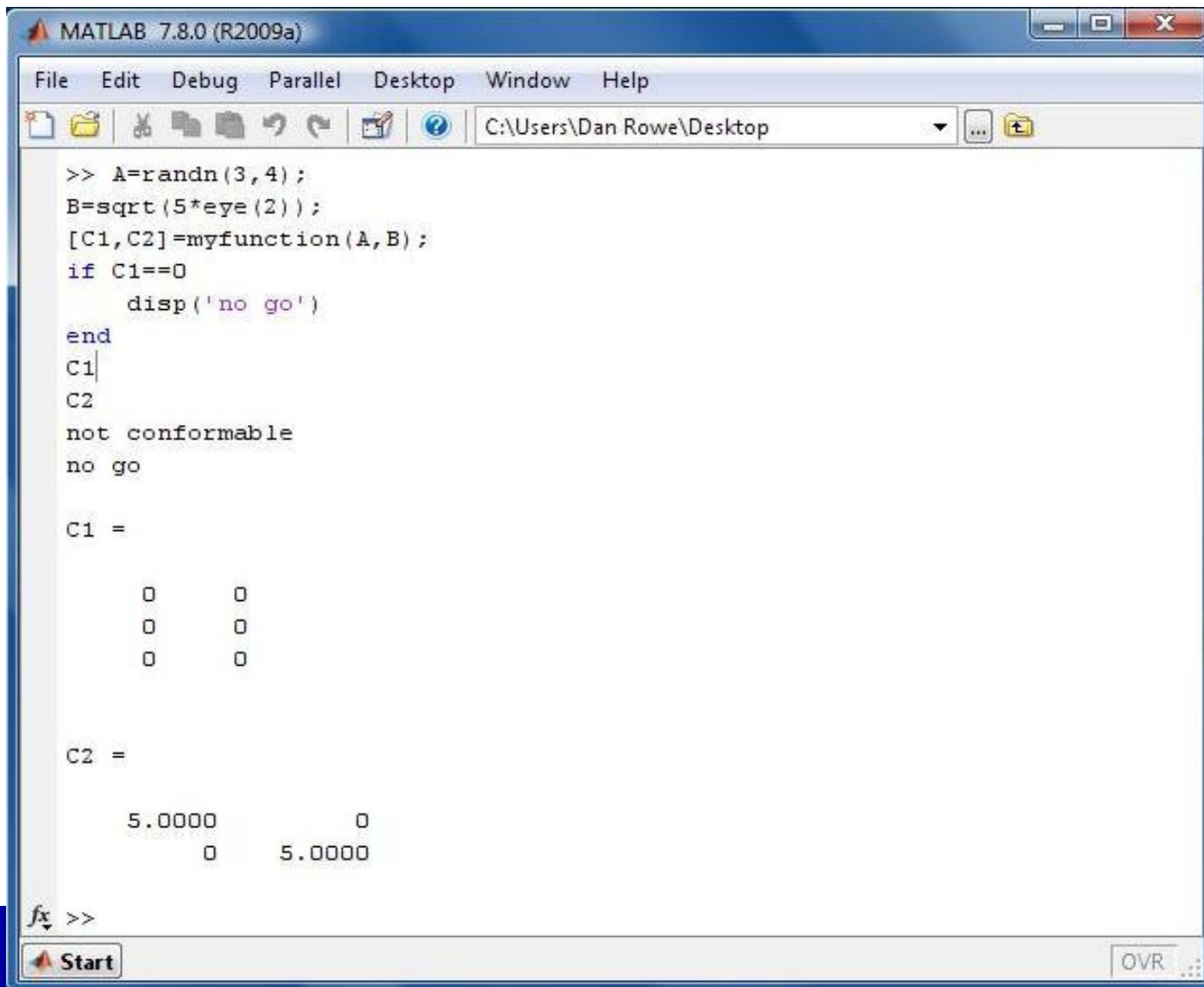
Functions and m-files

Create your own functions!



```
Editor - C:\Users\Dan Rowe\Desktop\usemyfunction.m
File Edit Text Go Cell Tools Debug Desktop Window Help
- 1.0 + ÷ 1.1 x % %
1 - A=randn(3,4);
2 - B=sqrt(5*eye(2));
3 - [C1,C2]=myfunction(A,B);
4 - if C1==0
5 -     disp('no go')
6 - end
7 - C1
8 - C2
script Ln 8 Col 3 OVR
```

Functions and m-files



```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop Window Help
C:\Users\Dan Rowe\Desktop
>> A=randn(3,4);
B=sqrt(5*eye(2));
[C1,C2]=myfunction(A,B);
if C1==0
    disp('no go')
end
C1
C2
not conformable
no go

C1 =

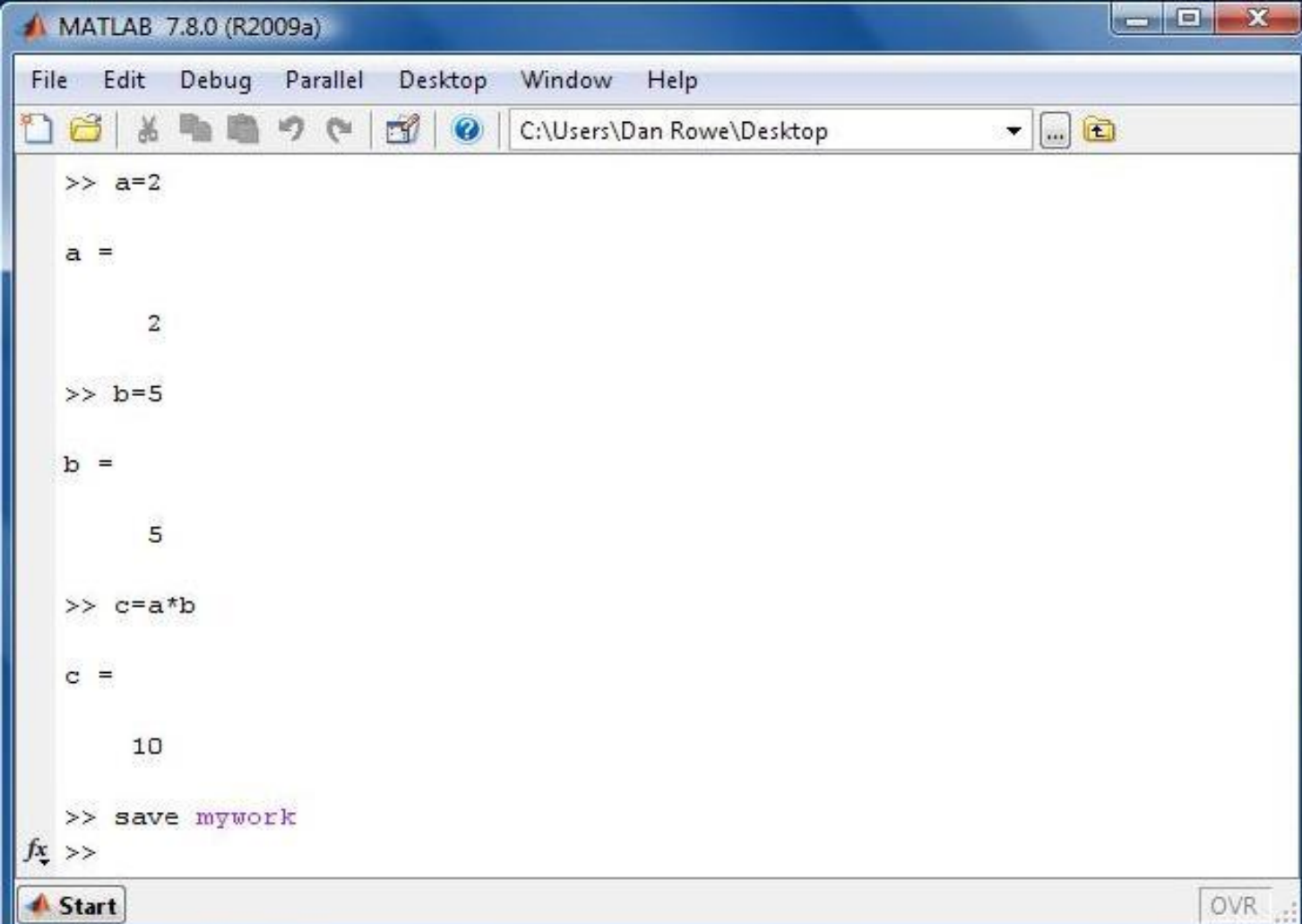
    0    0
    0    0
    0    0

C2 =

    5.0000    0
         0    5.0000

fx >>
Start OVR
```

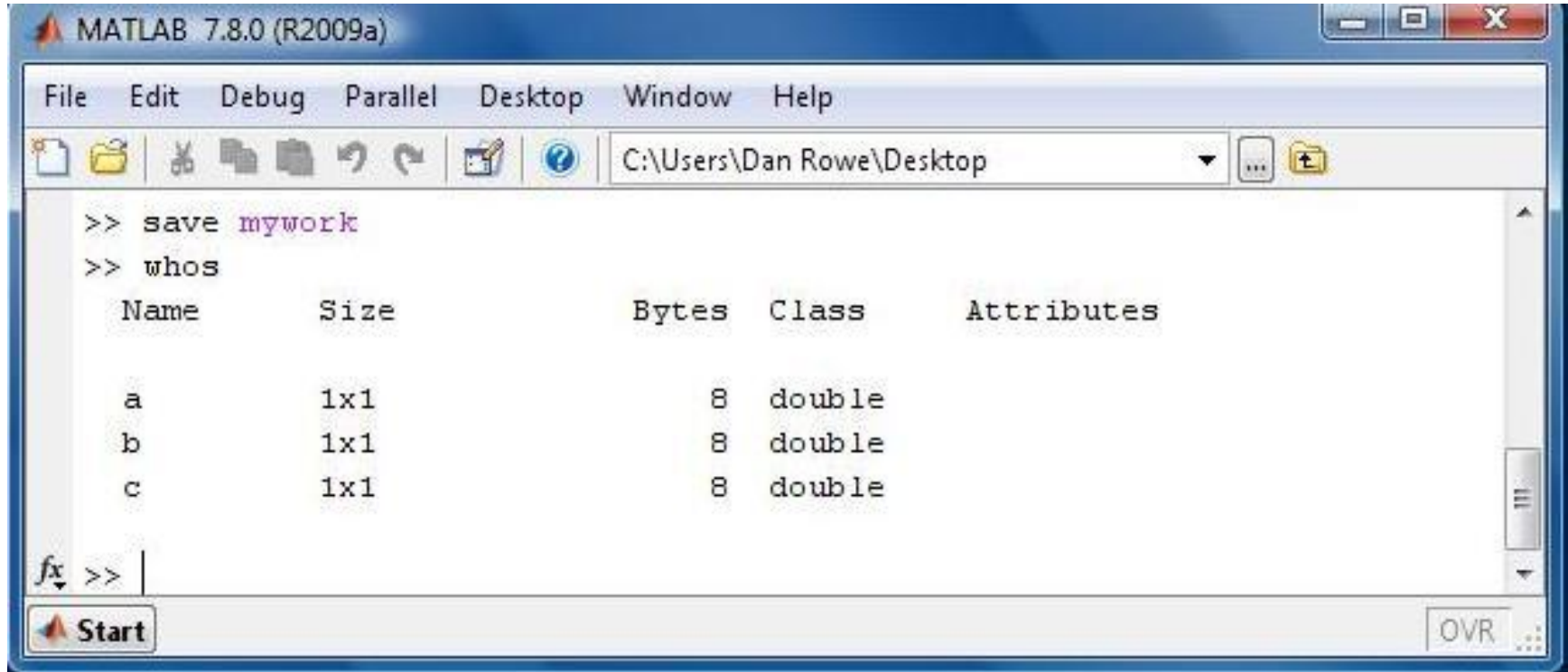
Importing and Exporting

A screenshot of the MATLAB 7.8.0 (R2009a) Command Window. The window title is "MATLAB 7.8.0 (R2009a)". The menu bar includes "File", "Edit", "Debug", "Parallel", "Desktop", "Window", and "Help". The toolbar contains icons for file operations and a path field showing "C:\Users\Dan Rowe\Desktop". The command window shows the following sequence of commands and outputs:

```
>> a=2  
  
a =  
  
    2  
  
>> b=5  
  
b =  
  
    5  
  
>> c=a*b  
  
c =  
  
   10  
  
>> save mywork  
fx >>
```

The window also features a "Start" button in the bottom left and an "OVR" indicator in the bottom right.

Importing and Exporting

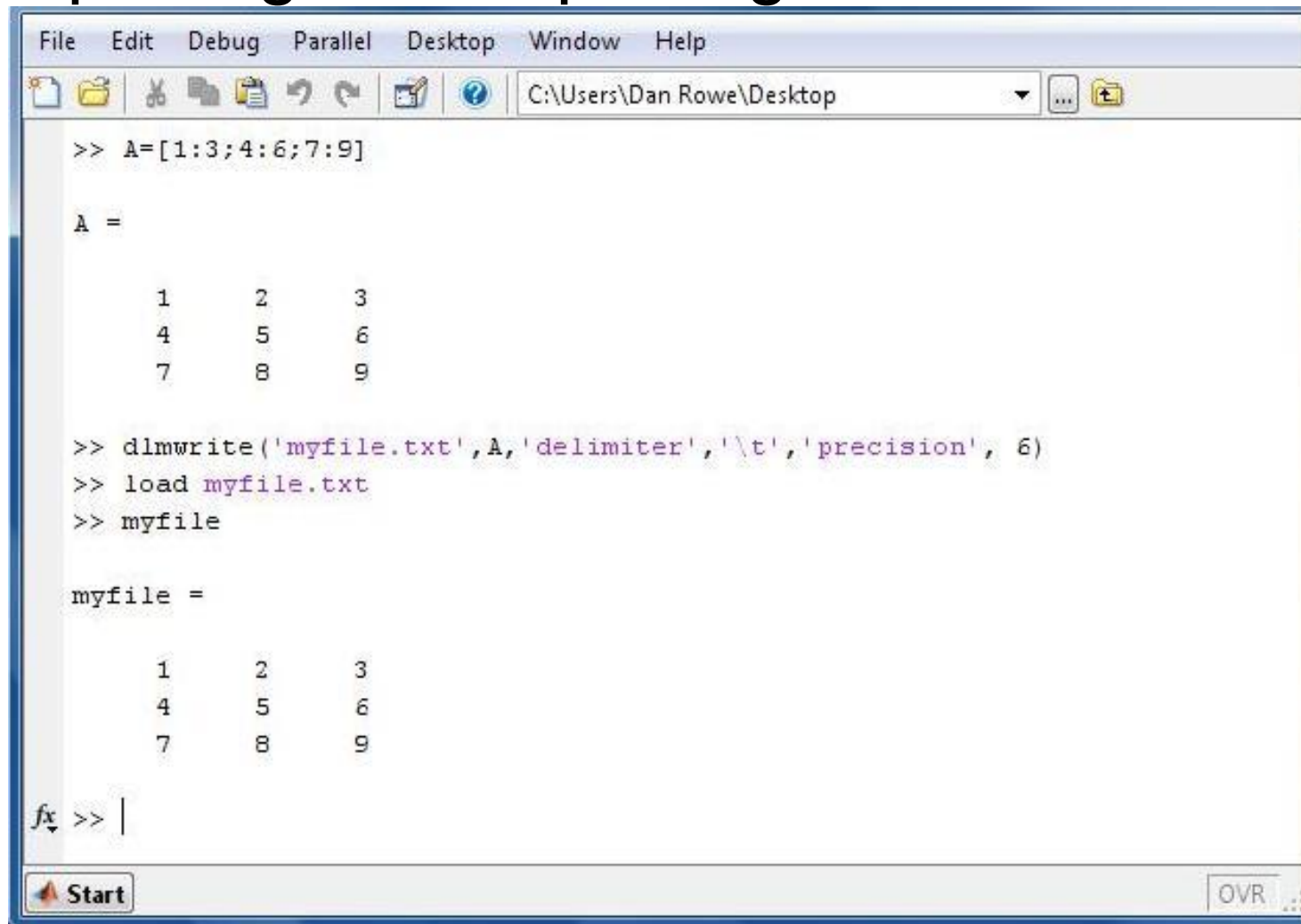


```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop Window Help
C:\Users\Dan Rowe\Desktop
>> save mywork
>> whos
Name      Size      Bytes  Class  Attributes
a         1x1         8  double
b         1x1         8  double
c         1x1         8  double
fx >> |
```

The file type is .mat

To read back in use “load mywork”

Importing and Exporting



The image shows a MATLAB Command Window interface. The title bar includes 'File', 'Edit', 'Debug', 'Parallel', 'Desktop', 'Window', and 'Help'. The address bar shows the current directory as 'C:\Users\Dan Rowe\Desktop'. The command prompt shows the following sequence of operations:

```
>> A=[1:3;4:6;7:9]

A =

     1     2     3
     4     5     6
     7     8     9

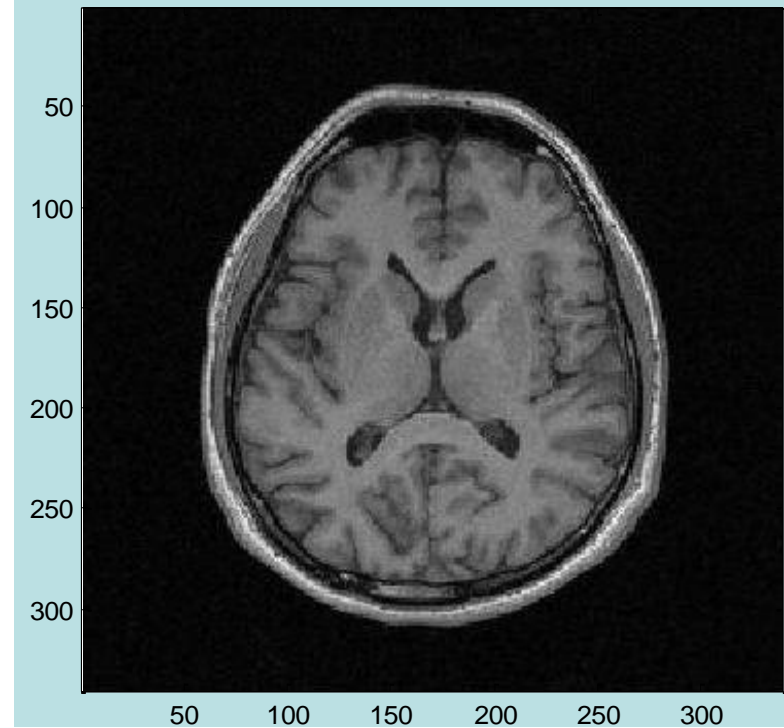
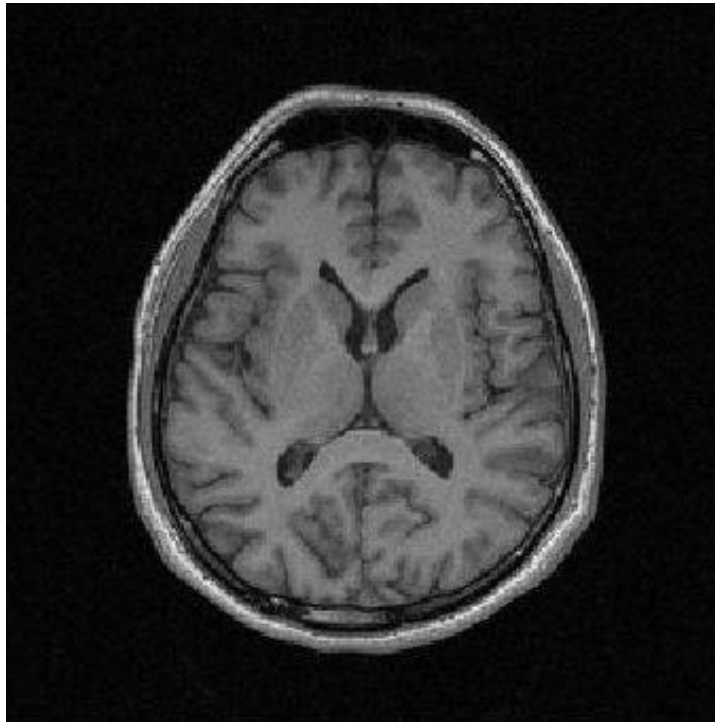
>> dlmwrite('myfile.txt',A,'delimiter','\t','precision',6)
>> load myfile
>> myfile

myfile =

     1     2     3
     4     5     6
     7     8     9
```

The window also shows a 'Start' button in the bottom left and an 'OVR' indicator in the bottom right.

Images



```
MATLAB 7.8.0 (R2009a)
File Edit Debug Parallel Desktop Window Help
C:\Users\Dan Rowe\Desktop
>> brainimage=imread('imageSWI.jpg');
figure(1)
image(brainimage)
axis image
fx >>
```

Some Additional Toolboxes

- Bioinformatics Toolbox
- Curve Fitting Toolbox
- Financial Toolbox
- Image Processing Toolbox
- Optimization Toolbox
- Signal Processing Toolbox
- Statistics Toolbox
- Wavelet Toolbox

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