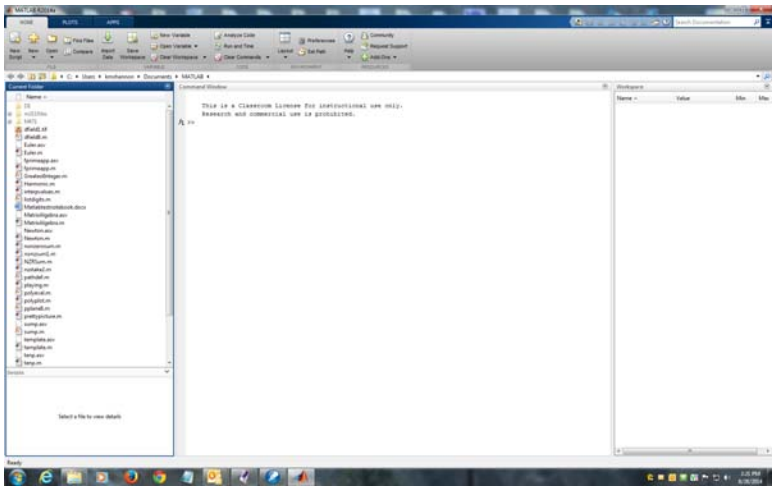
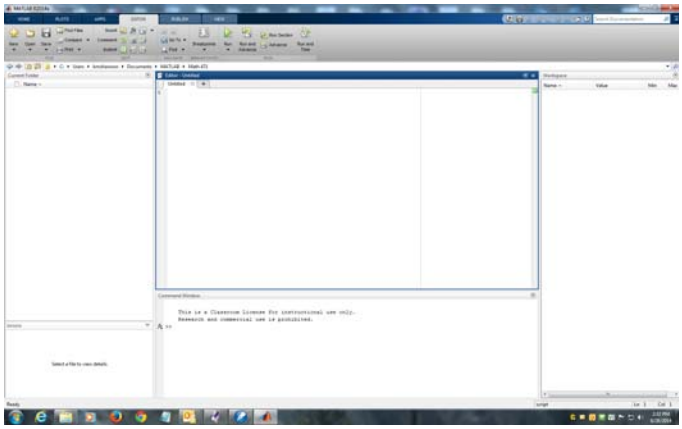
Matlab introductory exercise for Math 472.



First, open Matlab. You should see something like the picture to the right although your Current Folder is probably empty. Right click in the current folder box and select new folder - create a folder named Math 472. Notice that although the folder now appears in your current folder box it is faint. Now right click on the Math 472 folder and select add to path then selected folder and subfolders. The folder should then be more vivid. Files that are in this folder will now be on the Matlab "path" which is the collection of places it looks for user programs. Let us create and run a simple program:

1. Double click on the Math 472 folder so that it becomes your current folder.
2. From the "home" menu click on the + New button and select new script. An editor box should appear with an "untitled" file.

Type the following code into the editor box:



```
%code written by James F. Epperson
x = 1.e-10;
for k=1:6000
   y=1+x;
   if y<=1
      disp('machine epsilon =')
      disp(x)
      break
   end
    x=x*.99;
end
```

Now save the file by clicking save on the editor menu. Call the file machineeps.m
Now run the file by pressing the run button on the editor menu.
What do you find out? Play with this program a little. Change the x=1.e-10; line to x=1 save and run, what happens? What if you change it to x=2^-14? Try changing the x=x*.99; line to x=x/2; and the x=2^14 back to x=1 now what? Any idea what is going on?

By the way, the semicolon suppresses output. What happens if you delete one of the semicolons and run again?

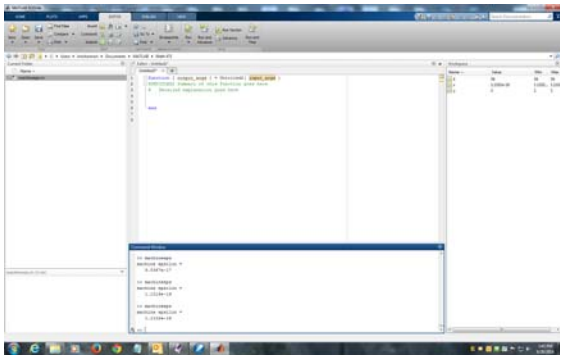
Now let's look at what some of the code means. Click in the command window and type: doc break then type: doc disp. What do break and disp mean? While you are in the command window, type x and hit enter, what do you see. Now type k and enter.

From a CS point of view is there a better way to write this program? Hint: type doc while in the command window.

Now Exit the editor by clicking the x at the upper right of the editor window. And type machineeps in the command window. What happens?

Now let's try a function.

1. From the home menu select + New then function. You should see something like the figure to the right.



2. Edit the file so that it contains:

```
function [ y ] = sinaxplusb( a,b,x )
% Compute values of a sine function with angular frequency a
% and phase shift b
t=a.*x + b;
y = sin(t);
end
```

3. Save the file as sinaxplusb.m - you generally want your file name to be the same as your function name so this is the default name given to the file when you press save.

4. Now in the command window type

```
sinaxplusb(2,pi,1)
```

and press enter. You should see:

```
ans =

   -0.9093
```

Now try:

```
x=1:.1:10;
plot(x,sinaxplusb(2,pi/4,x))
```

and a plot window should pop up.

Try:

```
plot(x,sinaxplusb(2,pi/4,x),x,sinaxplusb(3
,pi/4,x),x,sinaxplusb(4,pi/4,x))

plot(x,sinaxplusb(2,pi/4,x),x,sinaxplusb(2
,pi/2,x),x,sinaxplusb(2,pi,x))
```

and

```
a=2;
b=pi/4;
y=sinaxplusb(a,b,x);
figure
plot(x,y)
title(['graph of
sin(',num2str(a),'x+',num2str(b),')'])
```

Matlab is particularly good for calculations with matrices. Let's try the following: Create a new script file, lets call it Matrixfun.

Type the following code in your script file: (feel free to skip the comments. Try running the script when you get to a comment. Alternatively you could just type the code in the command window and see what happens as you go along)

```
% This is a program to explore Matlab vectors and
Matrices
%first define some vectors:
x = [1,2,3];
y = [2,4,6,8,10,12];
z=0:9;
%Now display them:
disp(x)
disp(y)
disp(z)
%display their transposes:
disp(x')
disp(y')
disp(z')
%let's try a matrix
A=[1,2,3;4,5,6;7,8,9];
disp(A)
disp(A')
disp(A.^2)
disp(A^2)
%how are these last two different?  What is
happening?
disp(A*x')
I=[1,0,0;0,1,0;0,0,1];
disp(I)
disp(x*A)
disp(x*I)
xt=x';
disp(I*xt)
I*x;
%play some more with this time permitting.
```

Now let's play with Matlab: can you find three numbers a, b and c such that in Matlab, this:

x=a+b;	and:	xx=b+c;	seem to give different results?
y=x+c;		yy=a+xx;	Should y-yy=0?
disp(y)		disp(yy)	Is it always?