MATLAB.1

Texts:
[B-D] Boyce & Diprima, Elementary Diff. Eq. & B.V. Problems, 7th Ed
[P-A] Polking & Arnold, ODEs using MATLAB, 2nd Ed

A. Getting Started with MATLAB

Read Chapters 1 and 3 in Polking. Do this before trying to go on.

B. More on Functions

Once a function y=g(x) is defined with a M-file you now know how to
graph it on an interval [a,b] using the plot command.First you partition
[a,b]. Next you evaluate g at these values . The plot command then
plots these vertices connecting them by lines to give a piecewise
linear approximation to the graph of g.

example: Plot sin(x^2) on [-1,4]. First we make a M-file.

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```
function y=g(x)
y=sin(x.^2);
```

****
Go to the command window and type:

****
```
x=-1:.1:4;
plot(x,g(x))
title('y=sin(x^2)')
```

****

Note x=[-1,-.9,..,3.9,4] and g(x)=[g(-1),g(-.9),..,g(3.9),g(4)] .

The graph is pretty crude because g oscillates more as x increases.
A second way to graph is with the command fplot.

example: (continued)

Go to the command window and type:

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```
fplot('g(x)',[-1,4])
```
****

One of the conveniences of fplot is , given g.m , it determines how
fine the partition of [a,b] needs to be (what the vector x should
be) so that the piecewise linear approximation gives an accurate
picture. A second feature of fplot is that it does not require
g.m to be written with array smart notation as is required when
using plot .
CAUTION!! Don't name a function y(x) (that is, use the file y.m);
fplot will not plot it. Also fplot only recognizes "x" as the independent
variable. So type "fplot('g(x)',[-1,4])" ,not "fplot('g(t)',[-1,4])"
even if you used "t" as the independent variable in g.m.

ASSIGNMENT 1 :

A. a) Let A= 1   7   B= -3   2   C= 3   4   1
            0 -3   3 -2   -2 -1   4
                                                0 -4   3

           v=[3 5]'   w=[2 -9]'   x=[-4 3]   y=[0   6 -3].

Note []' is the transpose of [].

Try to find the following combinations in MATLAB. Which are defined
and which are not? Where a combination is not defined explain why.

A*A   A*B   A*C   A.*A   A+B   A+C   A./C   A.\B

A*x   x*A   v*A   x.*A   A.*x   y*C   C*x   C*y

A*v   A*w   x+v   v+w   x*x   v.*w   w.*v   y.^2

y^2   A^2   x+y   v*y   v.*y   v*w   x*w   x.*w

b) Show that A= 1 -2   and B= -2 -3   commute.
             0   3   0   1

c) Consider the initial value problem

        z''(x) + 4*z(x)=0
                   z(0)=1
                   z(0)=-2.

From Section 5.2 in [B-D] we have a power series representation for z(x)

     z=a0 + a1*x + a2*x^2 + ...

where a0=z(0)=1 and a1=z'(0)=-2.

From Math 262 you can solve the i.v.p. exactly,

z=cos(2*x) -sin(2*x)   (for a review of this see Chapter 3 in [B-D]).

First find a2 and a3. Then make M.files for the three functions

z2(x) = a0 + a1*x + a2*x.^2,   z3(x) = a0 + a1*x + a2*x.^2 +a3*x.^3,

and z(x) = cos(2*x) -sin(2*x) for x in [0,pi/2].

Plot the three curves on the same figure. Use different line styles
for each curve, and label the figure appropriately.

B.Graph f(x) = cos(x.^4) on [0,2].
   a) Use the plot command with subintervals of length h =.2.
   b) Use fplot.

FOR ALL OF YOUR MATLAB GRAPHING HOMEWORK FOR THIS COURSE TITLE YOUR GRAPHS .