MATLAB.4

Plotting Solutions to ODEs

Consider $z'' + 4z = g(x)$, $z(0) = 0 = z'(0)$

where $g(x) = 0$ if $x<5$, $= (x-5)/5$ if $5<=x<10$, $=1$ if $10<x$.

First we make a M.file for the step function u(x)

```
*********************************************
function w=u(x)
if x<0
 w=0;
else
 w=1;
end
```

```
*********************************************
```

Next we make a M.file for g(x)

```
*********************************************
function w=g(x)
if x<5
 w=0;
elseif  x<10
 w=(x-5)/5;
else
 w=1;
end
*********************************************
```

The operations we use for conditions on x (e.g. x<5) in an if-elseif-else-end loop are < (less than), <= (less than or equal), == (equal), >= (greater than or equal), > (greater than), ~= (not equal).

Using Laplace transforms we solve for z by hand:

z(x)= u(x-5)*((x-5)/20-sin(2*(x-5))/40)- u(x-10)*((x-10)/20-sin(2*(x-10))/40)

We make a M.file for z

```
*********************************************
function w=z(x)
w= u(x-5)*((x-5)/20-sin(2*(x-5))/40)- u(x-10)*((x-10)/20-sin(2*(x-10))/40);
```

```
*********************************************
```

Notice how one M.file calls another. Now we plot g(x) and z(x) on the same graph

Go to the command window and type:

```
*********************************************
fplot('g',[0,25],'--')
```

```
hold on
fplot('z',[0,25])
grid
gtext('g(x)')
gtext('z(x)')
```

****

We can rescale the graph so that it will be a little inside the frame.Type:

****

```
axis([0,25,-.1,1.1])
```

ASSIGNMENT 4:

Do problem 16 in Section 6.4 of Boyce & DiPrima