

## Using MatLab to plot a family of solutions

The second-order linear, homogeneous equations is  $y'' + 2y' + y = 0$ . The general solution is  $y(x) = Ae^{-x} + Bxe^{-x}$ . We plot  $x$  between  $-0.5$  and  $3$  (at steps of  $0.01$  for smoothness). If one initial conditions is  $y(0) = 2$ , then it turns out that  $A = 2$ . (If the other initial condition is  $y'(0) = m$ , then  $B = m+2$ .) We will plot the family for values of  $B$  between  $-8$  and  $8$ , in steps of  $2$ .

Here is the sequence of MatLab commands which does this, and the resulting plot. Note the command **hold on**: This ensures that each plotted curve is drawn on the same set of axes.

```
>> x = -.5:.01:3;  
>> hold on  
>> for B=-8:2:8  
y=2*exp(-x)+B*x.*exp(-x); plot(x,y)  
end  
>>
```

