Homework #3

Due Wed at beginning of class.

Reading: Handout (especially “more techniques”)
Ref: Ma 5a Text

1. Find general solutions for the following linear differential equations: Hint: if you can’t make the equation into a known form, try to substitute u = f(x) for some f(x) to make a simpler problem.

a. $y''' - 2y'' - 3y' = 0$ b. $y'' - y' = x^2$ c. $x^2y' + y^2 = xyy'$

2. Find a nonzero solution of the equation: $y'' - 4y' + x^2(y' - 4y) = 0$ by inspection, then use the theorem from last homework to find a solution of:

$$y'' - 4y' + x^2(y' - 4y) = 2xe^{-\frac{x^3}{3}}$$

such that y=0 and y’=4 when x=0. Hint: it is easy to find the first solution -- then use it to make a first order equation for the other soluion...

3. Consider the resonant RLC circuit from the notes subjected to a sinusoidal ‘drive’ as follows:

$$v'' + \frac{R}{L}v' + \frac{1}{LC}v = \sin(\alpha t)$$

a. Since this is a linear second order equation, find the general solution by adding a particular solution to the solutions from the notes.

b. Plot v(t) for the case R=0.1, L=0.01, C= 0.01, and alpha is 1000, for t=0 to 0.03 sec, given v(0)=0, v’(0) = 100 V/sec. (You might want to use a computer for this....)