MAT 235– Ordinary Differential Equations
2nd Midterm

1) Write the form of a particular solution for each equation. (Do not calculate the constants)

a) $y'' - 2y' + 2y = (x+1)e^x \sin x + 3e^{2x}$

b) $y''''' - 8y''' + 42y'' - 104y' + 169 = 3xe^{2x}\cos 3x - x^2 e^{2x}\sin 3x + e^{3x}\sin 2x$.
$\left(\textbf{\textit{Hint :}}\ \text{Note that}\ x^4 - 8x^3 + 42x^2 - 104x + 169 = \left(x^2 - 4x + 13\right)^2\right)$

2) Solve the equation $y'' - 4y' + 4y = \dfrac{e^{2x}}{1+x}$.

(2)

3) a) Find the general solution of the equation
$x^2 y'' + 7xy' + 5y = 0$ (This is a Cauchy – Euler Equation)

b) Find the general solution of the equation $x^2 y'' + 7xy' + 5y = x$.

4) Use the power series method to solve the initial value problem

$y'' - 2xy' + 4y = 0, \qquad y(0) = 1, \qquad y'(0) = 0$

5) Use Frobenius' method to solve

$$y'' + \frac{3}{x} y' + 4x^2 y = 0$$