Math 3301 **Homework Set 5** **10 Points**

Fundamental Sets of Solutions

1. In the case of real, distinct roots ($r_1 \neq r_2$) I made the claim that the two solutions were $y_1(t) = \mathbf{e}^{r_1 t}$ and $y_2(t) = \mathbf{e}^{r_2 t}$. Show that these two solutions are a fundamental set of solutions and that the general solution in this case is in fact $y(t) = c_1 \mathbf{e}^{r_1 t} + c_2 \mathbf{e}^{r_2 t}$. Make sure that you clearly justify your answer.

2. Suppose that you know that $f(x) = x^{-3}$ and $W(f, g) = x^{-5}\,\mathbf{e}^{x}$. Determine the most general possible $g(x)$ that will give this Wronskian. You may assume that $x > 0$ for this problem.

Undetermined Coefficients, Part I

For problems 4 – 7 use the method of undetermined coefficients to determine the general solution to the given differential equation.

3. $y'' + 20y' + 100y = 50t^3 - 4t$

4. $4y'' + 4y' + 21y = -4\mathbf{e}^{9t}$

5. $y'' - 3y' - 28y = 20\sin(3t)$

6. $y'' - 9y' + 8y = 5\mathbf{e}^{3t}\cos(t)$

7. Solve the following IVP.

$$y'' + 4y = 200t^2\mathbf{e}^{6t} \qquad y(0) = -1, \quad y'(0) = -3$$