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 $f(x) = 2x^2$ and $W(f, g) = x^4\mathbf{e}^{-3x}$. 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. $4y'' - 11y' + 6y = 10\mathbf{e}^{7t}$

4. $y'' + 2y' + 37y = 20\cos(3t)$

5. $y'' - 16y' + 64y = 128t^2 + 16t - 4$

6. $y'' - 7y' = (106t + 1)\cos(2t)$

7. Solve the following IVP.

$$y'' - y' - 12y = 8t\,\mathbf{e}^{-4t} \qquad y(0) = 0, \quad y'(0) = 6$$