EXAM 1 - MATH 310 Friday, October 20

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Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Use the method of undetermined coefficients to find the general solution of

$$y'' - 4y' - 12y = te^{4t}.$$

2. Use the method of variation of parameters to find the general solution of

$$ty'' - (t+1)y' + y = t^2,$$

given that $y_1(t) = e^t$ and $y_2(t) = t + 1$ are solutions.

3. Find the general solution of the homogeneous fourth-order differential equation

$$y^{(4)} + 2y''' + 5y'' + 8y' + 4y = 0.$$

Hint: Observe that $r = -1$ is one solution of the characteristic equation.

4. Consider the differential equation

$$t^2y'' + 2ty' - 2y = 0.$$

Given that $y_1(t) = t$ is a solution, use reduction of order to find another linearly independent solution.

5. Decide whether the functions $f_1(t) = t^3$, $f_2(t) = 4t^2 - 2$, $f_3(t) = t^2 - t$ and $f_4(t) = 2t - 1$ form a linearly dependent or linearly independent set. If they are linearly dependent provide a linear dependence relation.