Name:_____
M555: Differential Equations I (Spring 2018)
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Good Problems 5: Sections 3.1–3.4

WICHITA STATE UNIVERSITY

Instructions *Complete all problems, showing enough work. A selection of problems will be graded based on the organization and clarity of the work shown in addition to the final solution (provided one exists).*

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1. Find the general solutions of the differential equations.

a.) $6y'' - y' - y = 0$

b.) $y'' - 2y' + 6y = 0$

c.) $y'' - 2y' + y = 0$

2. Find the particular solutions of the initial value problems.

a.) $\begin{cases} y'' + 4y' + 5y = 0 \\ y(0) = 1 \\ y'(0) = 0 \end{cases}$

b.) $\begin{cases} y'' + 4y' + 3y = 0 \\ y(0) = 2 \\ y'(0) = -1 \end{cases}$

3. Consider the differential equation

$$(x-1)\,y'' - x\,y' + y = 0, \quad x > 0.$$

a.) Show that $\varphi_1(x) = e^x$ is a solution.

b.) Use the method of reduction of order to find a second solution of the differential equation. Verify that the second solution is indeed a new solution.

4. Consider the differential equation

$$y'' + 4y = t^2 + 3e^t.$$

a.) Find the solution y_h of the associated homogeneous equation.

b.) Use the method of undetermined coefficients to find the general solution $y = Y + y_h$ of the given DE.