Name:_____

M555: Differential Equations I (Su.19)
Good Problems 4
Selections from Chapter 3

Instructions. Complete all problems, showing enough work. All work must be done on this paper. You may use your own hand-written notes, but you may not use any electronic devices.

1. [15 points] Find the general solution of the Euler equation $t^2y'' - 5ty' + 9y = 0$.

2. [15 points] Compute the Wronskian of the functions t^r and $t^r \ln(t)$ for $t > 0$ and $r \in \mathbb{R}$.

3. [20 points] Suppose g is an arbitrary continuous function. Write down an integral solution to the non-homogeneous differential equation,

$$y'' + 4y' + 13y = g(t).$$

4. [15 points] You wish to use the method of undetermined coefficients to determine a solution of the non-homogeneous differential equation. Write down a suitable form of the entire solution. Do **NOT** solve for the undetermined coefficients.

$$y'' + 2y' + 2y = 3e^{-t} + 2e^{-t}\cos t + 4e^{-t}t^2 \sin t$$

5. [15 points] Solve the initial value problem using your favorite method.

$$\begin{cases} y'' + 4y = t^2, \\ y(0) = 0, \quad y'(0) = 2. \end{cases}$$

6. [20 points] Consider the differential equation $xy'' - y' + 4x^3 y = 0$, $x > 0$.

a.) Show that $y_1(x) = \sin(x^2)$ is a solution.

b.) Use the method of reduction of order to find the general solution of the DE.

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