Name:_____
M555: Differential Equations I (Su.19)
Good Problems 7
Sections 5.5, 6.1–6.3

WICHITA STATE UNIVERSITY

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. [30 points] Consider the second order differential equation

$$x^2 y'' + x y' + (x-2) y = 0.$$

(*a.*) Show that $x_0 = 0$ is a regular singular point; (*b.*) Determine the indicial equation and the exponents at the singularity; and (*c.*) Find the series solution ($x > 0$) corresponding to the larger exponent.

2. [20 points] Use the definition of the Laplace transform to compute

$$\mathscr{L}\{t\sin(2t)\}.$$

You must use the definition to receive credit. Be sure to treat any improper integrals properly.

3. [20 points] Find the inverse Laplace transform, $\mathscr{L}^{-1}\{F(s)\}$, where

$$F(s) = \frac{2s+2}{s(s^2+4s+5)}.$$

4. [30 points] Use the method of Laplace transforms to solve the initial value problem

$$\begin{cases} y'' + 16y = \cos(2t), \\ y(0) = 1, \\ y'(0) = 0. \end{cases}$$

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