Name:_____
M555: Differential Equations I (Spring 2018)
Instructor: Justin Ryan
Good Problems 2 – Sections 2.1, 2.2, 2.4

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 particular solution of the initial value problem.

$$\begin{cases} ty' + (t+1)y = t, \\ y(\ln 2) = 1, \quad t > 0 \end{cases}$$

2. Use the method of variation of parameters (see exercise 2.1.38) to find the general solution to the differential equation. You must use variation of parameters to receive credit.

$$y' - 2y = t^2 e^{2t}$$

3. Solve the initial value problem and determine the interval on which the solution is valid.

$$\begin{cases} \dfrac{dy}{dx} = \dfrac{1+3x^2}{3y^2-6y}, \\ y(0) = 1 \end{cases}$$

4. Verify that $y_1(t) = 1 - t$ and $y_2(t) = -t^2/4$ are both solutions of the initial value problem

$$\begin{cases} y' = \dfrac{-t + \sqrt{t^2 + 4y}}{2}, \\ y(2) = -1. \end{cases}$$

Explain why the existence of two different solutions does not contradict the Fundamental Existence and Uniqueness Theorem.