Name:_____

M555: Differential Equations I (Su.19)
Final Exam, part II
Friday, 26 July 2019

WICHITA STATE UNIVERSITY

Instructions. Complete all problems, showing enough work. All work must be done on this paper. You may use two 3×5 in^2 index cards of your own hand-written notes, but you may not use any electronic devices.

Each question is worth 20 points.

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1. Solve the initial value problem,

$$\begin{cases} y' = \dfrac{\cos t}{t^2} - \dfrac{2}{t} y, \\ y(\pi) = 0, \quad t > 0. \end{cases}$$

2. Solve the initial value problem,

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

3. Consider the equation

$$y'' - 4y' + 4y = x^3 e^{2x} - x^2 \sin x + xe^x \cos x + 1.$$

Determine a suitable form for the general solution *via* the method of undetermined coefficients. **Do not solve for the coefficients.**

4. Consider the initial value problem,

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

Find the first four nonzero terms of the power series solution.

5. Consider the initial value problem,

$$\begin{cases} y'' + y = u_\pi(t) - u_{2\pi}(t), \\ y(0) = y'(0) = 0. \end{cases}$$

Use the method of Laplace transforms to find the solution.

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