

Test Total

Name _____

Final Exam Introduction to Differential Equations 3450:335 Dr. Norfolk May 3, 2004

Show all of your work and explain your reasoning.

1. Use Laplace transforms to solve the differential equation

$$y' + y = g(t), \text{ where } y(0) = 3, g(t) = \begin{cases} 0 & , 0 \leq t < 1 \\ 5e^{-t} & , 1 \leq t \end{cases} .$$

15 points

2. Use Laplace transforms to solve the differential equation

$$y'' + 4y' + 4y = 56t^6 e^{-2t}, y(0) = 1, y'(0) = 0.$$

15 points

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3. Use Laplace transforms to find $x(t)$ ONLY, where $x(0) = 0$, $x'(0) = 0$, $y(0) = 0$, $y'(0) = 0$

$$x' - x + y' = t$$

$$x' + x - y'' = 0$$

15 points

4. Use power series about $x = 0$ to find a general solution to

$$y'' - xy' - 2y = 0$$

15 points

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5. Solve $\frac{1}{x^2} \frac{dy}{dx} - 3 \cos(x^3) y^3 = 0$, $y(0) = 1$

10 points

6. Solve the differential equation $x \frac{dy}{dx} + (1 + x)y = 4x^3 e^{-x}$.

10 points

7. Use the transformation $v = \sqrt{y}$ to transform the *Bernoulli* equation $y' - xy = x^2 \sqrt{y}$ into a linear equation in *standard form*.

10 points

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