Test Total

Name _____

Exam 2 **Ordinary Differential Equations** **Dr. Kreider**
4 Nov 13 **Show your work and use correct notation**

1. Solve the initial value problem $y'' + 8y' + 20y = 0$ with $y(0) = 0$, $y'(0) = -2$.

12 pts

2. Find the general solution to $y'' + 4y' + 4y = 6e^{-2x}$ using variation of parameters.

14 pts

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3. Find the general solution to $y'' + 2y' + y = 5e^{3x}$ using undetermined coefficients.

14 pts

4. Set up but do not solve. Write the differential equation and initial conditions that describe the following spring-mass system. A 2 kg object stretches a spring 1 m. The object is removed and is replaced with a 5 kg object. The spring-mass system is immersed in a liquid that imparts a resistance equal to 3 times the instantaneous velocity. The object is released from rest at a point 2 m above the equilibrium position.

10 pts

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5. Find the general solution to $x^2y'' - 3xy' + 25y = 0$.

12 pts

6. Solve the initial value problem $\bar{\mathbf{X}}' = \begin{pmatrix} 4 & 1 \\ -3 & 0 \end{pmatrix} \bar{\mathbf{X}}$ with $\bar{\mathbf{X}}(0) = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$.

14 pts

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7. A spring-mass system has solution $x(t) = 3e^{-t}\sin(2t) - 2e^{-t}\cos(2t) + 5\sin(2t)$. (i) Is there damping in the system? Why or why not? (ii) Is there resonance in the system? Why or why not? (iii) Is there a transient component to the solution? If so, what is it? (iv) Is there a steady state component to the solution? If so, what is it?

10 pts

8. Find the general solution to $\bar{\mathbf{X}}' = \begin{pmatrix} 3 & 1 \\ -1 & 1 \end{pmatrix} \bar{\mathbf{X}}$.

14 pts

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