Test Total

Name ________________________________

Exam 2 **Ordinary Differential Equations** **Dr. Kreider**
4 Nov 09 **Show your work and use correct notation**

1. Solve the initial value problem $y'' + 4y' + 13y = 0$ with $y(0) = 0$, $y'(0) = 3$.

12 pts

2. Find the general solution to $y'' + 6y' + 9y = 2e^{-3x}$ using variation of parameters.

14 pts

Page 1: 26

3. Find the general solution to $y'' + 3y' + 2y = 20 \sin 2t$ using undetermined coefficients.

14 pts

4. One solution to $x^2y'' - 5xy' + 9y = 0$ is $y_1 = x^3$. Use reduction of order to find the second linearly independent solution y_2. You may use the formula directly, or derive y_2 from the ODE, as you choose. You know the answer already since you recognize the equation; the point is to go through the derivation.

10 pts

Page 2: 24

5. Find the general solution to $x^2y'' - 5xy' + 34y = 0$.

12 pts

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

14 pts

Page 3: 26

7. A spring-mass system is governed by the equation $x'' + 4x = \cos 2t$. DO NOT SOLVE THE EQUATION!
   (a) Does the system exhibit resonance? Justify your answer carefully in one or two sentences.

   (b) Draw a **rough qualitative** sketch of the general solution if the initial conditions are $x(0) = 0$, $x'(0) = 1$.

10 pts

8. Find the general solution to $\bar{\mathbf{X}}' = \begin{pmatrix} 0 & 1 \\ -9 & 6 \end{pmatrix} \bar{\mathbf{X}}$.

14 pts

Page 4: 24