

Name: \_\_\_\_\_

MTH U345

Ordinary Differential Equations

Fall 2008

Quiz 2

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1. 5 points Convert the following second order differential equation to a system of first order differential equations. **DO NOT TRY TO SOLVE** the system.

$$y''(t) = 2y'(t) - 5y(t) + 7y^3(t).$$

2. 5 points Write the following system of first order linear equations in matrix form:

$$\frac{dx_1}{dt} = 6x_1 + 5x_2, \quad \frac{dx_2}{dt} = -8x_1 + 3x_2.$$

3. 10 points Solve the initial value problem  $y'' + 7y' + 12y = 0$ ,  $y(0) = 2$ ,  $y'(0) = -1$ .

4. 10 points Solve the following (partially decoupled) system:

$$\frac{dx}{dt} = 3x + y, \quad \frac{dy}{dt} = 2y.$$

5. 10 points Consider the linear system  $Y' = AY$ , where  $A = \begin{bmatrix} 5 & 3 \\ 4 & 6 \end{bmatrix}$ .

(a) Verify that  $Y_1(t) = e^{2t} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$  and  $Y_2(t) = e^{9t} \begin{bmatrix} 3 \\ 4 \end{bmatrix}$  are solutions to this system.

(b) Find the solution  $Y(t)$  satisfying the initial value  $Y(0) = \begin{bmatrix} 7 \\ 14 \end{bmatrix}$ .