

Name: _____ Sec. Number: _____

TA: _____ Sec. Time: _____

Math 20D.

Quiz 2

April 18, 2008

Answer each question completely, and show your work.

*If you use extra paper, write your name on each extra page,
and staple the question page and your own added pages together.*

1. (30 points) Use the substitution $v = y^{-2}$ to find the solution to the initial value problem

$$t^2 y' + 2ty - 5y^3 = 0, \quad y(1) = \frac{1}{\sqrt{2}}, \quad t \geq 1.$$

2. (30 points) Sometimes a constant equilibrium solution has the property that solutions on one side of the equilibrium approach it, while solutions on the other side of the equilibrium depart from it. Such equilibria are called *semistable*. For the following equation, determine the constant equilibrium solutions, classify each as asymptotically stable, unstable or semistable, and sketch several graphs of solutions in the ty -plane corresponding to different initial conditions y_0 . Sketch the correct concavity of the solution graphs in the ty -plane.

$$y' = y(y - 7)^2, \quad -\infty < y_0 < \infty$$

3. (40 points) Determine whether the following differential equations are exact. Only in the case that the equation is exact, find the (implicit) solution.

(a) $(xe^y + x \sin(xy)) y' + xe^y + y \sin(xy) = 0.$

(b) $(6xy + x^3) y' + 3y^2 + 3x^2 y = 0.$