

Please PRINT your name and ID# below. Write clearly and cross-out work not to be graded. The questions are to be answered directly on this paper as indicated.

Name: _____ ID: _____

1. Answer the following for the differential equation

$$\frac{dy}{dx} = \frac{y^2}{1-y}$$

- (a) What is the order? (2 pts.)
- (b) Is it linear or nonlinear? WHY? (You must answer both questions for full credit.) (6 pts.)
- (c) Is it separable? (2 pts.)
- (d) Find an implicit solution to this equation and state when it is valid. (25 pts.)
- (e) Find the equilibrium solution. (10 pts.)

2. (a) Which of the following two differential equations is exact? Show the calculations justifying your answer.

$$(i) \quad \frac{dy}{dx} = -\frac{2x+y}{x+3y} \qquad (ii) \quad \frac{dy}{dx} = -\frac{2x-y}{x-3y} \qquad (20 \text{ pts.})$$

- (b) Solve the one that is exact, subject to the initial condition $y(1) = 2$, and state where the solution is valid. (30 pts.)