Name:_____

Recitation:_____

Math 240
Exam 1
Feb. 14, 2006

Problem	Score
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Closed book. You may use a calculator and one 8 ½ × 11" sheet of handwritten notes (both sides). You must show your work to receive full credit. Write solutions in explicit form if possible. Each problem is worth 10 points.

Pledge:
On my honor, as a student, I have neither given nor received unauthorized aid on this examination: _____ _____

(signature) (date)

Name:_____

1. Find all solutions to $\dfrac{dy}{dx} = 3x + 2y$.

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2. Solve the initial value problem $\dfrac{dy}{dx} = \dfrac{x^2 + y^2}{y^2 - 2xy}, \quad y(0) = 1.$

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3. Find $y(1)$ where $y(x)$ is the solution to the initial value problem,

$$\frac{dy}{dx} = y^2 - y, \quad y(0) = 1.5.$$

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4. Find all solutions to $\frac{dy}{dx} = \frac{2xy}{x^2 + y^2}$.

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5. Using the improved Euler method with step size $h = 0.5$, approximate $y(1)$ if $\frac{dy}{dx} = 2x - y^2, \quad y(0) = 2$.

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6. Find and classify (as stable, unstable, or semi-stable) the equilibrium points of $\frac{dP}{dt} = P^2\left(4 - P^2\right)\left(25 - P^2\right)$.

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7. Show that $2 < y(2) < 3$ for the solution to the initial value problem, $\frac{dy}{dx} = 1 - x^2 + 2xy - y^2, \quad y(0) = 1$. One way to do this is to show that $x < y(x) < x + 1$ for $x > 0$, but there are other ways that work as well.

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8. In learning theory, an autonomous equation of the form $\frac{dC}{dt} = rC\left(a - \ln(C)\right)$ is sometimes used to model the percentage of correct answers C as a function of instructional time t, where r and a are constants (this is called a Gompertz equation). If $\lim_{t \to \infty} C(t) = .85$, what, if anything, can you conclude about the parameters r and/or a?

Name:_____