

Math 207
Exam 1
April 23rd, 2010

Name: _____

1. Your exam contains 6 questions and 5 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. You have 50 minutes for this exam.
3. Make sure to **ALWAYS SHOW YOUR WORK**; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. Put a box around your final answer where applicable.
5. Leave answers in exact form (as simplified as possible).
6. You are allowed one 3" × 5" notecard (both sides).
7. You may use a calculator for this exam, but I will not give credit for work done solely on a calculator (aside from arithmetic).
8. If you need extra space, use the back of the exam and clearly indicate this.

Problem	Total Points	Score
1	11	
2	23	
3	29	
4	14	
5	11	
6	12	
Total	100	

1. (11 pts.) Is the implicitly defined relation, $x + y = \arctan y$, a solution to the equation

$$1 + y^2 + y^2 \frac{dy}{dx} = 0?$$

2. (23 pts.) Consider the initial value problem $\frac{dy}{dx} + \frac{3y}{x} + 2 = 10x$, $y(1) = 4$.

(a) (8 pts.) Determine whether the existence-uniqueness theorem implies that the given initial value problem has a unique solution.

(b) (15 pts.) Solve the initial value problem. Express your solution(s) explicitly.

3. (29 pts.) Find the general solution to each equation below.

(a) (15 pts.) $\frac{dy}{dx} - xe^{y+x^2} = 0$ (Write your answer explicitly.)

(b) (14 pts.) $(2y \sin x \cos x + 2y^3)dx + 4xy^2 dy = 0$ (Write your answer implicitly.)

4. (14 pts.) Show that the equation $\frac{dy}{dx} = \frac{x^3+3y^3}{2xy^2}$ is homogeneous and then solve the equation. You may express your solution(s) implicitly.

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5. (11 pts.) A bank account grows continuously at an annual rate of 5%. The account is also decreased continuously by \$10,000 each year. The account initially has \$500,000. Set up, but **do not solve**, a differential equation to model this situation. Be sure to define any variables you use and give an initial condition.

6. (12 pts.)

(a) (4 pts.) What are the equilibrium solutions of the differential equation $\frac{dp}{dt} = p(1-p)(p-2)$?

(b) (8 pts.) For the initial value problem, $\frac{dp}{dt} = p(1-p)(p-2)$, with $p(0) = 3$, what is $\lim_{t \rightarrow \infty} p(t)$?
Justify your answer.

Note: You do **not** need to fill this space with justification for #6b!!