



Math 202 — Spring 2005
 Differential Equations, sections 1-4
 Quiz 1, March 10 — Duration: 1 hour



GRADES (each problem is worth 12 points):

| 1 | 2 | 3 | 4 | 5 | 6 | TOTAL/72 |
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| | | | | | | |

YOUR NAME:

YOUR AUB ID#:

PLEASE CIRCLE YOUR SECTION:

- | | | | |
|----------------|----------------|-----------------|----------------|
| Section 1 | Section 2 | Section 3 | Section 4 |
| Recitation F 1 | Recitation F 2 | Recitation F 12 | Recitation F 3 |
| Ms. Zantout | Ms. Zantout | Ms. Zantout | Dr. Yamani |

INSTRUCTIONS:

1. Write your NAME and AUB ID number above, and circle your SECTION.
2. Solve the problems inside the booklet. Explain your steps precisely and clearly to ensure full credit. Partial solutions will receive partial credit. Each problem is worth 12 points.
3. You may use the back of each page for scratchwork OR for solutions. There are two extra blank sheets at the end, for extra scratchwork or solutions. If you need to continue a solution on another page, INDICATE CLEARLY WHERE THE GRADER SHOULD CONTINUE READING.
4. It is okay to leave the solution of any differential equation in implicit form.
5. Do as much of the exam as you can, and budget your time carefully. If you cannot do a certain integral, just leave it as an integral in your solution for partial credit on the rest of the problem.
6. No calculators, books, or notes allowed. Turn off and put away any cell phones or beepers.

GOOD LUCK!

An overview of the exam problems. Each problem is worth 12 points.
The problems are repeated inside the booklet — PLEASE
SOLVE EACH PROBLEM ON ITS CORRESPONDING PAGE INSIDE.

1. a) Find the general solution of $(\cos x)y' = (y^2 - 4)\sin x$.
b) (UNRELATED to part a) Find the general solution of $2y' + y = x$.

2. Find the general solution of $\frac{dy}{dx} = -\left(\frac{y^3 + 2y^2x}{x^3}\right)$. (Note the minus sign.)

3. a) Solve the initial-value problem $3y'' - 8y' - 3y = 0$; $y(0) = 1$, $y'(0) = 2$.
b) (UNRELATED to part a) Find the general solution of $y''' + 4y' = 0$.

4. Find the general solution of $(3y \ln y + \cos(x^3)) dx + (x \ln y + x) dy = 0$.

5. Given that $y_1 = x$ is a particular solution of the following differential equation, find its general solution:

$$(x^2 - 1)y'' + \left(\frac{3}{x} - 5x\right)y' + \left(5 - \frac{3}{x^2}\right)y = 0.$$

6. Consider the initial-value problem $y' = \sqrt{x + y^2}$; $y(3) = 1$. DO NOT TRY TO SOLVE THIS EQUATION!
 - a) On what interval are we guaranteed that there exists a unique solution $y = y(x)$ to the above initial-value problem? Justify your reasoning.
 - b) Use the approximation $\Delta y \approx y' \Delta x$ to find an **approximate** value for $y(3.01)$. Your answer should be a specific number.
 - c) (Challenge) Is the approximate value of $y(3.01)$ larger or smaller than the true value? Justify your reasoning.