

Differential equations

Math 217 — Fall 2009

September Exam

This exam contains fourteen problems numbered 1 through 14. Problems 1 – 13 are multiple choice problems. Problem 14 is a free-response question.

Problem 1

The general solution of the differential equation

$$y' = 1 + x + y + xy$$

satisfies which of the following implicit equations.

- A) $\ln|1 + y| = x + C$ B) $\ln|1 + y| = x - x^2 + C$ C) $\ln|1 + y| = x + \frac{1}{2}x^2 + C$
D) $\ln|1 + y| = x - \frac{1}{2}x^2 + C$ E) $\ln|1 + y| = x + x^2 + C$ F) $\ln|1 + y| = \frac{1}{2}x + C$

Problem 2

For which of the initial value problems

$$\text{I) } \frac{dy}{dx} + xy = x + \frac{1}{x}, \quad y(1) = 0,$$

$$\text{II) } \frac{dy}{dx} + xy = x + \frac{1}{x}, \quad y(0) = 1,$$

$$\text{III) } \frac{dy}{dx} = y^{\frac{1}{3}}, \quad y(0) = 0,$$

do the results from class guarantee the existence of a unique solution.

- A) Only I B) Only II C) Only III D) I and II E) I and III
F) II and III

Problem 3

Which of the following differential equations is exact?

- A) $(3xy - x^3)dx + (3xy - 3x^2y) dy = 0$ B) $e^y dx + e^x dy = 0$ C) $xy^2 - x^2yy' = 0$
D) $6xy^2 + (6x^2y + 1)\frac{dy}{dx} = 0$ E) $xy dx + xy dy = 0$ F) None of the above