

Math 132, Spring 2009 - Exam 3

NAME:

STUDENT ID NUMBER:

This exam contains sixteen questions. The first fourteen are multiple choice questions and count for five points each. There is no partial credit on these questions, so read each question carefully, check your arithmetic and make sure that you have marked the answer you intended to mark. The last two questions, which are each worth fifteen points, require written answers, and some partial credit might be given. However, no credit will be given for information that is not germane to the problem at hand. Please make sure to write your name and student ID number on the pages that include your answers to the last two questions. In fact, you will get one point on each of these two questions for writing your name and ID number legibly.

1. Suppose

$$\frac{dy}{dx} = 1/y$$

and  $y(0) = 1$ . Find  $y(4)$ .

- (a) 0
- (b)  $\pm 2$
- (c)  $\pm 3$
- (d)  $\pm 4$
- (e)  $e^4$
- (f)  $\ln 4$
- (g)  $1/4$
- (h)  $-1/4$

$$\frac{dy}{dx} = \frac{1}{y}$$

$$\therefore y dy = dx$$

$$\therefore \frac{1}{2} y^2 = x + c$$

$$y(0) = 1 \Rightarrow \frac{1}{2} = 0 + c \Rightarrow c = \frac{1}{2}$$

$$\therefore y^2 = 2x + 1$$

$$\therefore y = \pm \sqrt{2x+1}$$

$$\therefore y(4) = \pm \sqrt{9} = \pm 3$$

2. Solve the differential equation

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

with initial condition  $y(0) = 0$ .

- (a)  $e^y = e^{x^2} - 1$
- (b)  $e^y = \frac{1}{2} e^{x^2} + \frac{1}{2}$
- (c)  $e^y = \frac{1}{2} e^{x^2}$
- (d)  $e^y = e^{x^2}$
- (e)  $e^{-y} = e^{x^2} - 1$
- (f)  $e^{-y} = \frac{1}{2} e^{x^2} + \frac{1}{2}$
- (g)  $e^{-y} = \frac{1}{2} e^{x^2}$
- (h)  $e^{-y} = e^{x^2}$

$$e^y dy = x e^{x^2} dx$$

$$e^y = \int x e^{x^2} dx$$

$$u = x^2 \\ du = 2x dx$$

$$= \frac{1}{2} \int e^u du$$

$$= \frac{1}{2} e^u + c$$

$$= \frac{1}{2} e^{x^2} + c$$

$$y(0) = 0 \Rightarrow 1 = \frac{1}{2} + c \Rightarrow c = \frac{1}{2}$$

$$\therefore e^y = \frac{1}{2} e^{x^2} + \frac{1}{2}$$