

Math 126 C - Spring 2012

Exam 2

May 17, 2012

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Student ID Number: \_\_\_\_\_

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- You are allowed to use a scientific calculator (**NO GRAPHING CALCULATORS**) and one **hand-written** 8.5 by 11 inch page of notes. Put your name on your sheet of notes and turn it in with the exam.
- Check that your exam contains all the problems listed above.
- Clearly put a box around your final answers and cross off any work that you don't want us to grade.
- Show your work. The correct answer with no supporting work may result in no credit. Guess and check methods are not sufficient, you must use appropriate methods from class.
- Unless otherwise indicated, your final answer should be given in exact form whenever possible.
- Cheating will not be tolerated. Keep your eyes on your exam!
- You have 50 minutes to complete the exam. Use your time effectively, spend less than 10 minutes on each page and make sure to leave plenty of time to look at every page. Leave nothing blank, show me what you know!

GOOD LUCK!

1. (6 pts) You are standing on the surface  $z = \frac{x}{y^2 + 1} - \ln(xy + 1) + xye^x$  at the point  $(x, y) = (1, 1)$ . Is it steeper to walk in the positive  $x$ -direction or the positive  $y$ -direction? (Justify your answer with appropriate partial derivative calculations).

2. (8 pts) You lose your grip on a balloon in a twister. The balloon's location is given by the position vector function  $\mathbf{r}(t) = \langle \cos(2t), \sin(2t), t + \sin(t) \rangle$ . Find the minimum speed AND give the tangential component of acceleration at the first positive time where the minimum speed occurs.

3. (10 pts) Find and classify all critical points of the surface  $f(x, y) = \frac{1}{6}x^2y + 2x - 5 \ln(y) + y$ .

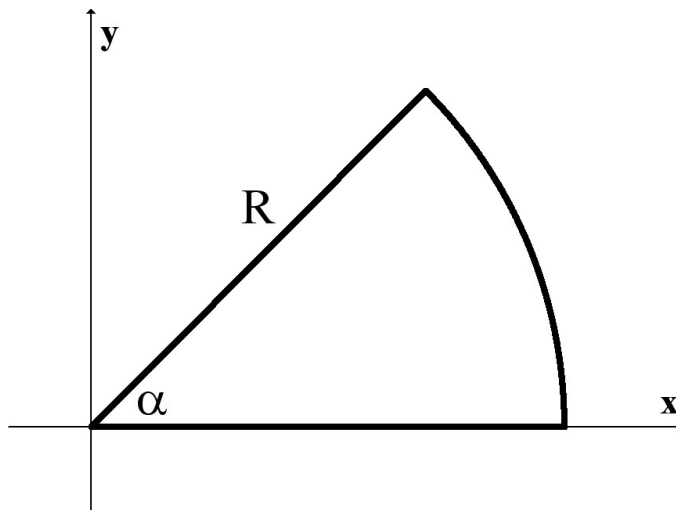
4. (a) (8 pts) Evaluate:  $\int_0^4 \int_{\frac{1}{2}x}^{\sqrt{x}} \frac{e^y}{y} dy dx.$

(b) (8 pts) Set up and evaluate a double integral to find the volume of the solid that is bounded below by  $z = 0$ , bounded above by  $z = x^2$ , and bounded by the planes  $x = 0$ ,  $y = 0$  and  $x + y = 3$ .

5. Dr. Loveless likes flat circular wedges (especial if they come with pie on top).

Consider a thin wedge shaped lamina with angle  $\alpha$  ( $0 \leq \alpha \leq 2\pi$ ), radius  $R$  and vertex at the origin as shown. Assume the density of the wedge is proportional to the distance from the origin.

(a) (8 pts) Find the  $x$ -coordinate of the center of mass,  $\bar{x}$ . (Your answer may contain  $\alpha$  and  $R$ ).



(b) (2 pts) What point  $(x, y)$  does the center of mass approach as  $\alpha$  goes to zero? (Your answer may contain  $R$ ).