

Math 126 - Fall 2012

Exam 2

Nov 15, 2011

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. (12 pts) A constant force $\mathbf{F} = \langle 12, -9, 0 \rangle$ acts on a particle of mass $m = 3$. Newton's Law says that $\mathbf{F} = m\mathbf{a}$, where \mathbf{a} is the acceleration. At the time $t = 0$, the particle is located at $(0, 0, 7)$ and the initial velocity is $\langle 1, 3, -2 \rangle$.

(a) Find the location of the particle at time $t = 1$.

(b) Find the curvature at time $t = 0$.

(c) Find all times when the tangential component of acceleration is zero.

2. (12 pts)

(a) Using the linear approximation at $(2, 1)$, estimate the value of the function

$$f(x, y) = y \cos(2 - xy) + x^2 + \ln(y)$$

at the point $(2.1, 0.95)$.

(b) Find the volume of the solid that is below the surface $z + x^2 = 4$, above $z = 0$, and between the surfaces $x = 0$, $y = \sqrt{x}$, and $y = 1$.

3. (12 pts)

(a) Consider the region D bounded between $x^2 + y^2 = 16$ and $x^2 + y^2 = 25$ in the **first quadrant**.

Evaluate
$$\iint_D \frac{y^2 \cos(\sqrt{x^2 + y^2})}{(x^2 + y^2)^{3/2}} dA$$

(b) By switching the order of integration, evaluate
$$\int_0^8 \int_{\sqrt[3]{y}}^2 \sqrt{x^4 + 1} dx dy.$$

4. (12 pts) Find non-negative numbers x , y and z that minimize the quantity

$$A = x^2 + 3y^2 + z,$$

subject to the condition $xyz = 12$.

Give x , y , and z as decimals correct to 3 digits after the decimal.

(Use the second derivative test and your decimal answers at the end of the problem to verify your answer is a local minimum).