Math 126 - Spring 2010
Exam 2
May 18, 2010

Name: _____

Section: _____

Student ID Number: _____

1	12	
2	12	
3	8	
4	9	
5	9	
Total	50	

- 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 and correct to two digits if given as a decimal.
- 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 points) The position function of a particle is given by $\mathbf{r}(t) = \langle t^2 - 3t, \frac{1}{\pi}\cos(\pi t), \frac{1}{\pi}\sin(\pi t)\rangle$

   (a) (7 pts) Calculate the following three values and fill in the blanks:

      i. The curvature at $t = 0$ is _____.

      ii. The speed at $t = 0$ is _____.

      iii. The normal component of acceleration at $t = 0$ is _____.

   (b) (5 pts) Find the equation for the normal plane at the first time the particle passes through the vertical plane $x = -2$.

2. (12 points) Let $z = f(x, y) = x \ln(2x - y) + x \cos(y^2)$

(a) (3 pts) Find and sketch the domain of the function, $f(x, y)$.

(b) (7 pts) Find the equation for the tangent plane to $f(x, y)$ at $(x, y) = (\frac{1}{2}, 0)$.

(c) (2 pts) Use the linear approximation to $f(x, y)$ at $(\frac{1}{2}, 0)$ to approximate $f(0.51, -0.01)$.

3. (8 points) Sketch the region of integration in the xy-plane, then use it to evaluate the integral

$$\int_0^4 \int_{\sqrt{y}}^2 e^{(x^3)}\, dxdy.$$

4. (9 points) Find the volume under the upper hemisphere of the sphere $x^2+y^2+z^2 = 9$ and above the region on the xy-plane that lies to the right of the y-axis and between $x^2+y^2 = 1$ and $x^2+y^2 = 4$.

5. (9 points) You are building an aquarium. The aquarium is a rectangular box with no top. The sides will be made out of glass which costs \$1.50 per square foot and the bottom will be made out of slate which is \$8.00 per square foot. If the volume must be 9 cubic feet, find the dimensions that will **minimize costs**. Use the second derivative test to verify that your answer is indeed a minimum.