MATH 126 C & D
Exam II
November 24, 2009

Name _____

Student ID #_____ Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- Your exam should consist of this cover sheet, followed by five problems. Check that you have a complete exam.
- Show all work and justify your answers.
- Unless otherwise indicated, your answers should be exact values rather than decimal approximations. (For example, $\frac{\pi}{4}$ is an exact answer and is preferable to its decimal approximation 0.7854.)
- You may use a scientific calculator and one 8.5×11-inch sheet of handwritten notes. All other electronic devices (including graphing calculators) are forbidden.
- Turn your cell phone OFF and put it AWAY for the duration of the exam.
- There are multiple versions of this exam. Save yourself the hassle of a hearing before the Faculty Council on Academic Conduct: do not cheat.

GOOD LUCK!

1. (10 points) Suppose a particle moves with position vector

$$\mathbf{r}(t) = t^2\mathbf{i} + \left(e^{t-2} - 3t\right)\mathbf{j} + \left(\frac{1}{2}t^2 + 4t\right)\mathbf{k}.$$

   (a) Compute the tangential and normal components of the particle's acceleration vector at $t = 2$.

   (b) Find the equation of the normal plane to $\mathbf{r}(t)$ at $t = 2$.

2. (10 points) Let $f(x, y) = e^{-xy} \cos y$.

   (a) Compute $f_{yx}(x, y)$.

   (b) Find the equation of the plane tangent to $f(x, y)$ at $(\pi, 0)$.

   (c) Use linear approximation to approximate $f(3.15, 0.001)$. (Give an exact answer and a decimal approximation, giving at least **four** digits after the decimal.)

3. (10 points) Let $g(x, y) = \frac{1}{2}x^2 + xy - 3x + \frac{1}{3}y^3 - 3y$.

   (a) Find and classify all critical points of $g(x, y)$.

   (b) What is the smallest value of the function $g(x, 0)$?

4. (10 points) Evaluate the integral

$$\int_0^{\sqrt{\pi/2}} \int_x^{\sqrt{\pi/2}} \cos(y^2)\, dy\, dx.$$

5. (10 points) Evaluate the integral

$$\iint_D \frac{xye^x}{(x^2+y^2)^{3/2}}\,dA,$$

where $D = \{(x, y) : x^2 + y^2 \leq 9, x \geq 0, y \geq 0\}$.