MATH 126 D
Exam II
November 22, 2011

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	12	
2	13	
3	12	
4	12	
Total	50	

- Your exam should consist of this cover sheet, followed by 4 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.
- The use of headphones or earbuds during the exam is not permitted.
- There are multiple versions of the exam, you have signed an honor statement, and cheating is a hassle for everyone involved. DO NOT CHEAT.
- Turn your cell phone OFF and put it AWAY for the duration of the exam.

GOOD LUCK!

1. (12 points) Let $\overrightarrow{r}(t) = \langle \sin 3t, \ln(\sin 3t), \cos 3t \rangle$ for $0 < t < \frac{\pi}{3}$.

   (a) Find the unit tangent, unit normal, and binormal vectors at $t = \frac{\pi}{6}$.

   ANSWERS:

   $\overrightarrow{T}\left(\frac{\pi}{6}\right) =$ ________________ $\overrightarrow{N}\left(\frac{\pi}{6}\right) =$ ________________ $\overrightarrow{B}\left(\frac{\pi}{6}\right) =$ ________________

   (b) Give the equation of the normal plane to $\overrightarrow{r}(t)$ at $t = \frac{\pi}{6}$.

2. (13 points) Find the point(s) on the surface $x^2 = 12 + yz$ closest to the point $(0, 1, 3)$. For full credit you must show some work OR write a sentence or two to explain how you know that your answer gives the minimal distance.

3. (12 points)

(a) Calculate the iterated integral.

$$\int_0^4 \int_0^2 xy\sqrt{x^2+1}\,dx\,dy.$$

(b) Sketch the region of integration and change the order of integration.

$$\int_0^{10} \int_0^{x^2+1} h(x,y)\,dy\,dx.$$

4. (12 points) Compute the area of the region **to the right of the y-axis**, outside the circle $r = \sin(\theta)$, and inside the cardiod $r = 1 + \sin(\theta)$.