MATH 126 B & C
Exam I
Autumn 2013

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	6	
2	4	
3	8	
4	10	
5	12	
6	10	
Total	50	

- Your exam should consist of this cover sheet, followed by 6 problems. Check that you have a complete exam.
- Pace yourself. You have 50 minutes to complete the exam and there are 5 pages. Try not to spend more than 10 minutes on each page.
- Unless otherwise indicated, show all your 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 and programmable calculators and calculators with calculus functions) are forbidden.
- You are not allowed to use scratch paper. If you need more room, use the back of the page and indicate to the reader that you have done so.
- 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. (6 points) A point has Cartesian coordinates $(-5, -5\sqrt{3})$.

   (a) Find polar coordinates (r, θ) for the point with $r > 0$ and $\theta < 0$.

   (b) Find polar coordinates (r, θ) for the point with $r < 0$ and $\theta < 0$.

2. (4 points) Let $\mathbf{v} = \langle 2, -1, 4 \rangle$. Find a unit vector that is orthogonal to $\mathbf{v}$.

3. (8 points) Identify the surface in $\mathbb{R}^3$ given by the equation. You do not need to show any work. Choose your answer from the following:

cone
ellipsoid
elliptic cylinder
elliptic paraboloid
hyperbolic cylinder
hyperbolic paraboloid
hyperboloid of one sheet
hyperboloid of two sheets
parabolic cylinder

(a) $48x + y^2 = 4z^2$

(b) $4y^2 - z^2 = 1$

(c) $x^2 + 6x - y^2 - 4y + z^2 = -5$

(d) $x^2 + 6x - y^2 - 4y + z^2 = 3$

4. (10 points) Find parametric equations for the line of intersection of the planes

$$-x + y + 2z = 5 \text{ and } 3x - 4y + 6z = 10.$$

5. (12 points) Consider the curve defined by the vector function

$$\mathbf{r}(t) = \langle 3\cos t, 4\sin t, 2t\rangle, t \geq 0.$$

(a) Find the curvature at the point $(0, 4, \pi)$.

(b) Give another point (x, y, z) on the curve at which the curvature is the same as you found in part (a). You do not need to show any work.

6. (10 points) The graph below shows the curve $\vec{r}(t) = \langle t^2, kt - t^3 \rangle$ for $t \geq 0$, where k is a constant. The line through the points A and B is tangent to $\vec{r}(t)$ at A. The x-coordinate of A is 4 and B is the point $(28, 0)$. Find the value of k.