MATH 126 B
Exam I
Autumn 2014

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	9	
2	5	
3	6	
4	10	
5	10	
6	10	
Total	50	

- Your exam should consist of this cover sheet, followed by 6 problems on 5 pages. 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.
- You are not allowed to use your phone for any reason during this exam. Turn your phone off and put it away for the duration of the exam.

GOOD LUCK!

1. (9 points) Let $\mathbf{a} = \langle 2, -5, 7 \rangle$ and $\mathbf{b} = \langle -3, 0, 1 \rangle$.

   (a) Compute $\text{proj}_{\mathbf{b}}\mathbf{a}$.

   (b) Find the cosine of the angle between $\mathbf{a}$ and $-\mathbf{b}$.

   (c) Give a vector $\mathbf{v}$ of length 4 that is orthogonal to both $\mathbf{a}$ and $\mathbf{b}$.

2. (5 points) Find the distance from the origin to the center of the sphere given by the equation

$$x^2 + y^2 + z^2 = 8x - 6y + 14z + 7.$$

3. (6 points) The point P has Cartesian coordinates $\left(\frac{3}{2}, -\frac{3\sqrt{3}}{2}\right)$. Find polar coordinates (r, θ) for P such that:

   (a) $-\dfrac{\pi}{2} < \theta < \dfrac{\pi}{2}$

   (b) $r < 0$

4. (10 points) The plane $\mathscr{P}$:

   - has x-intercept -3;
   - has y-intercept 1; and
   - is parallel to the line $x = 3 - t, y = 4 + 2t, z = -5t$.

   Find the equation for $\mathscr{P}$. Put your final answer in the form $ax + by + cz = d$.

5. (10 points) Find the length of the curve defined by

$$\mathbf{r}(t) = \left\langle \frac{1}{4}e^{4t}, \frac{\sqrt{2}}{2}e^{2t}, t \right\rangle$$

from $t = 0$ to $t = 5$.

6. (10 points) Find parametric equations for the line tangent to the curve

$$\mathbf{r}(t) = \left(t^3 - t\right)\mathbf{i} + \left(t^6 + t^2 + 1\right)\mathbf{j} + \left(t^2 + 5t\right)\mathbf{k}$$

at the point $(0, 3, -4)$.