MATH 126 E
Exam I
Spring 2017

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."

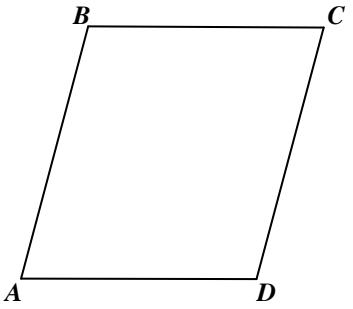
SIGNATURE:_____

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

- Your exam should consist of this cover sheet, followed by 5 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 TI 30XII S calculator and one 8.5×11-inch sheet of handwritten notes. All other calculators, electronic devices, and sources 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. (10 points) The parallelogram below has corners at the points A, B, C, and D. We know $A(3, 0, 4)$, $B(1, 2, 1)$, and $\overrightarrow{AD} = \langle 2, 1, -2 \rangle$.



   (a) Compute the area of the parallelogram.

   (b) Give parametric equations for the line through the points A and C.

2. (10 points) Suppose a and b are real numbers and let $\mathbf{v} = \langle 1, a, 2\rangle$ and $\mathbf{w} = \left\langle b, \frac{3}{\sqrt{5}}, 0 \right\rangle$. Find all pairs a and b so that $\mathbf{v}$ and $\mathbf{w}$ are orthogonal and $|\mathbf{v}| = |\mathbf{w}|$.

3. (10 points) Consider two lines given by the vector functions

$$\mathbf{r}_1(t) = \langle 1 - 2t, 3 + t, 5 - 6t \rangle \text{ and } \mathbf{r}_2(s) = \left\langle 3 + s, -\frac{1}{2}s, 1 + 3s \right\rangle.$$

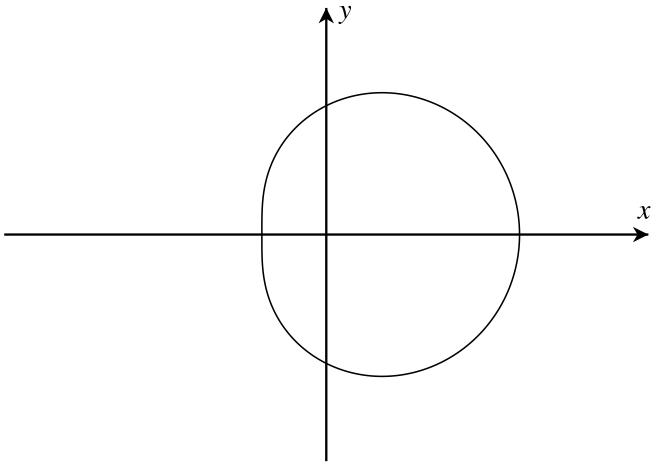
(a) Determine whether the lines are parallel or intersecting. (They are not skew.) Justify your answer.

(b) Find the equation of the plane that contains both lines. Write your equation in the form $ax + by + cz = d$.

4. (10 points)

   (a) Find polar coordinates (r, θ) with $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$ for the point whose Cartesian coordinates are $\left(-5\sqrt{3}, -5\right)$.

   (b) The graph below shows the polar curve $r = 2 + \cos(\theta)$.



   Compute the slope of the line tangent to the curve at its positive y-intercept.

5. (10 points) Compute the curvature of

$$\mathbf{r}(t) = \langle 1 - t, 1 + t, 24 + 4t^2 \rangle$$

at the point where the curve intersects the elliptic paraboloid

$$z = x^2 + 3y^2.$$