MATH 126 E
Exam I
April 26, 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	12	
3	12	
4	14	
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)

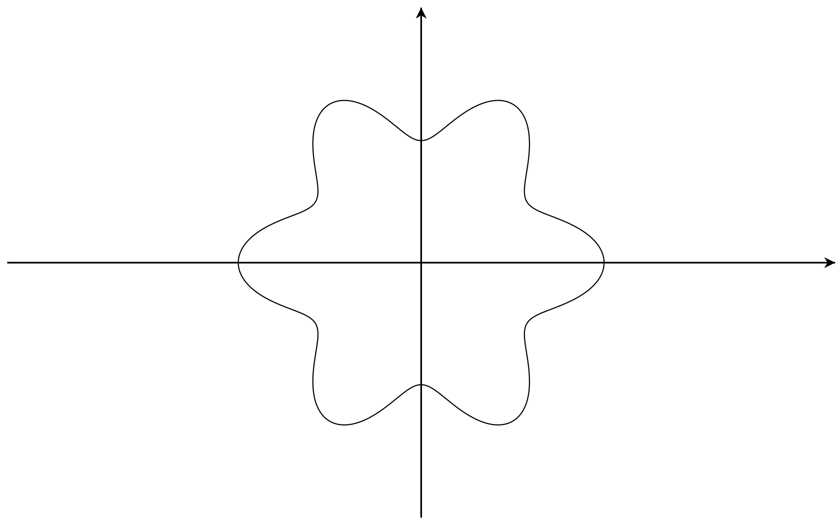
   (a) Find the point of intersection of the following lines.

$$\ell_1 : x = 3 - t, y = 4 + 2t, z = 1 + t$$

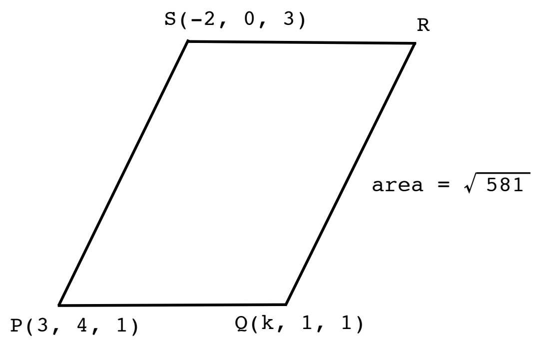
$$\ell_2 : x = 1 + s, y = 2 - 4s, z = -2s$$

   (b) Find an equation for the plane that contains the two lines in part (a).

2. (12 points) Below is the graph of the polar curve $r = 6 + \cos(6\theta)$. Find the equation of the line tangent to this curve at $\theta = \dfrac{\pi}{6}$.



3. (12 points) The area of the parallelogram $PQRS$ pictured below is $\sqrt{581}$.



(a) Find the x-coordinate of the point Q (k in the picture—assume $k > 0$).

(b) Find the coordinates of the point R.

4. (14 points) Consider the position function $\vec{r}(t) = \langle \cos 3t, 4t, \sin 3t \rangle$.

   (a) Compute the unit tangent and unit normal vectors at t.

   (b) Find the line of intersection of the normal plane and osculating plane to $\vec{r}(t)$ at $t = \dfrac{\pi}{12}$.