

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)

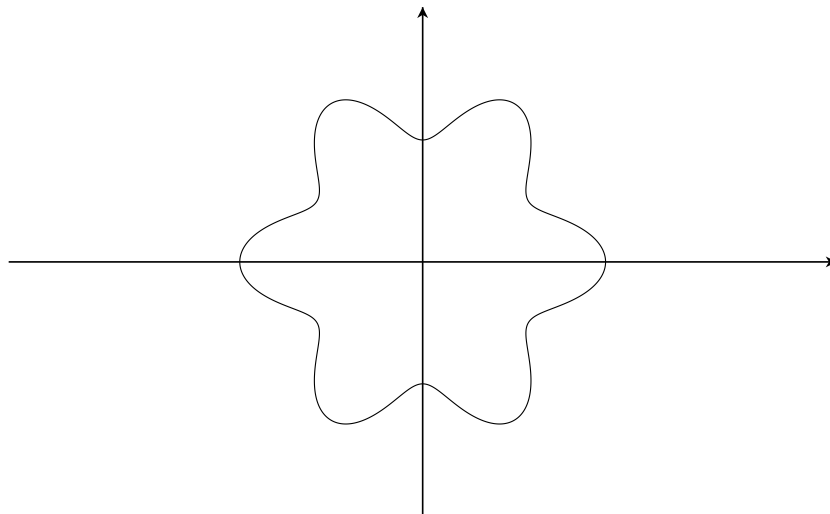
(a) Find the point of intersection of the following lines.

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

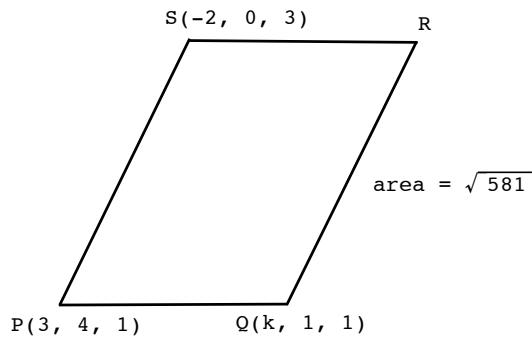
$$\ell_2 : x = 1 + s, y = 2 - 4s, z = -2s$$

(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  $\theta = \frac{\pi}{6}$ .



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  $t = \frac{\pi}{12}$ .