MATH 126 D
Exam I
October 25, 2011

Name ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

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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	10	
3	12	
4	6	
5	10	
Total	50	

- Your exam should consist of this cover sheet, followed by 5 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 (x, y, z) at which the line

   $$x = 4 - 3t, y = 2 + 11t, z = 5 - t$$

   intersects the plane

   $$3x - y + z = 8.$$

   (b) Find the equation of the plane that contains the line
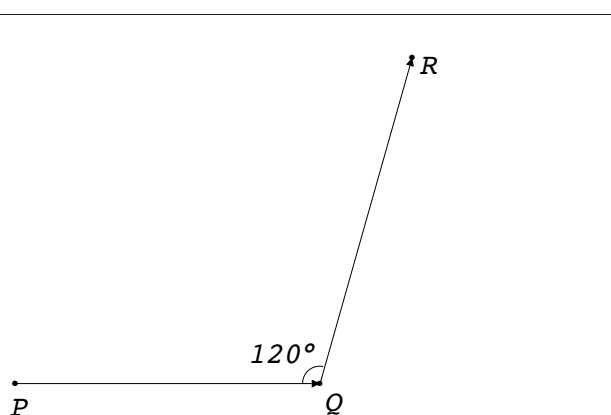
   $$x = 1 + t, y = 2 - t, z = 3t$$

   and the point $(5, 0, -4)$.

2. (10 points) Let $\vec{r}(t) = \langle t^2, t^2 \sin t, t^2 \cos t \rangle$.

   (a) Give parametric equations for the line tangent to $\vec{r}(t)$ at $t = \pi$.

   (b) Find the length of the curve represented by $\vec{r}(t)$ on the interval $0 \le t \le 1$.

3. (12 points) Consider the following figure, in which $|\overrightarrow{PQ}| = 9$ and $|\overrightarrow{QR}| = 11$.

(a) Compute $\overrightarrow{PQ} \cdot \overrightarrow{QR}$.

(b) Compute the area of the triangle with vertices P, Q, and R.

(c) Which of the following are true? (Check all that apply.)

_____ $\overrightarrow{PQ} \times \overrightarrow{QR}$ points into the page

_____ $\overrightarrow{PQ} \times \overrightarrow{QR}$ points out of the page

_____ $\overrightarrow{PQ} \times \overrightarrow{QR} = \overrightarrow{QR} \times \overrightarrow{PQ}$

_____ $\overrightarrow{PQ} \times \overrightarrow{QR}$ is parallel to $\overrightarrow{QR} \times \overrightarrow{PQ}$

_____ $\overrightarrow{PQ} \times \overrightarrow{QR}$ is orthogonal to the vector $\dfrac{\overrightarrow{PQ}}{|\overrightarrow{PQ}|}$
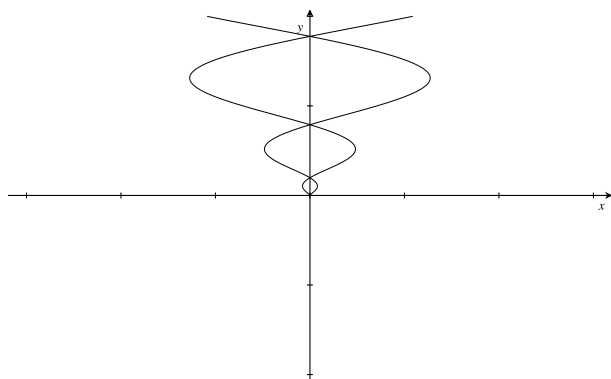
4. (6 points) Match each set of parametric equations with the curve they represent on the interval $-10 \le t \le 10$. (You DO NOT need to show any work to justify your answers.)
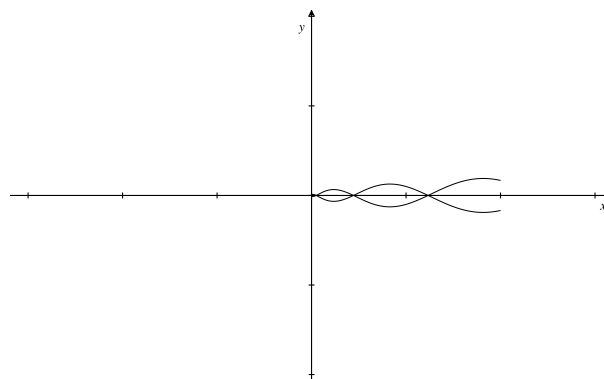
(a) $x = t^2 \sin t, y = t^2 \cos t$

(b) $x = t^2 \sin t, y = t^2$

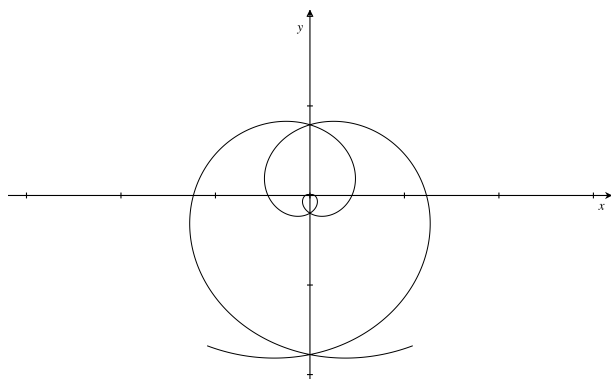(c) $x = t^2, y = t \cos t$

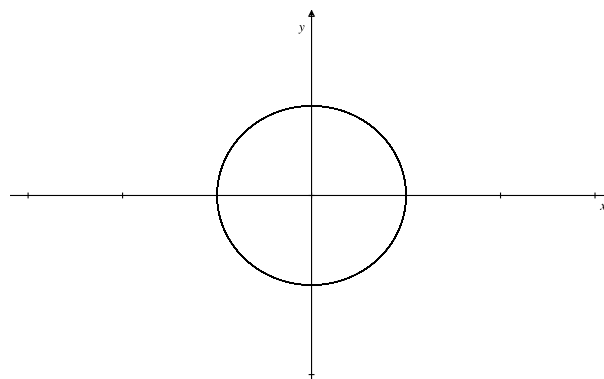(d) $x = 50 \sin t^2, y = 50 \cos t^2$

ANSWER: _____

ANSWER: _____

ANSWER: _____

ANSWER: _____

5. (10 points)

    (a)   i. The Cartesian coordinates of a point are $(-1, \sqrt{3})$. Give polar coordinates (r, θ) for this point with $r > 0$ and $-2\pi \leq \theta \leq 0$.

        ii. The Cartesian coordinates of a point are $(-5, -5)$. Give polar coordinates (r, θ) for this point with the property that $0 \leq \theta \leq \pi$.

        iii. The polar coordinates of a point are $\left(-3, \frac{\pi}{6}\right)$. Give Cartesian coordinates (x, y) for this point.

    (b) Find a Cartesian equation for the curve $r = 7\cos\theta$ and sketch it.