Math 126 C, D - Spring 2006 Mid-Term Exam Number Two May 11, 2006

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
Total	60	

- Complete all questions.
- You may use a scientific, non-graphing calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
- If you use a trial-and-error or guess-and-check method, or read a numerical solution from a graph on your calculator, when an algebraic method is available, you will not receive full credit.
- You may use one hand-written 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 50 minutes to complete the exam.

Name: _____

1. Find the slope of the tangent line to the polar curve

$$r = \frac{1}{\theta}, \theta > 0$$

at the point where it intersects the cartesian curve

$$x^2 + y^2 = \frac{1}{9}.$$

2. At what point(s) is the tangent line to the curve

$$x = t^3 - 3t, y = t^2 + 2t$$

parallel to the line with parametric equations

$$x = 3t + 5, y = t - 6$$
?

3. For any m > 0, the helix determined by the position function

 $\vec{r}(t) = \langle \cos t, \sin t, mt \rangle$

has constant curvature that depends on m. Find the value of m such that the radius of curvature at any point on the curve is 3.

4. A particle is moving so that its position is given by the vector function

$$\vec{r}(t) = \langle t^2, t, 5t \rangle$$

Find the tangent and normal components of the particle's acceleration vector.

5. Reparametrize the curve

$$\vec{r}(t) = \langle 5t - 1, 2t, 3t + 2 \rangle$$

with respect to arc length measured from the point where t = 0 in the direction of increasing t.

- 6. Let $f(x, y) = x^2 y + x \sin y \ln(x y^2)$.
 - (a) Find $f_y(x, y)$.

(b) Find $f_{xy}(x, y)$.