# Math 126 C, D - Spring 2006 <br> Mid-Term Exam Number Two <br> May 11, 2006 

Name: $\qquad$ Section: $\qquad$

| 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.

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

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

parallel to the line with parametric equations

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

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

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

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

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

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

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

with respect to arc length measured from the point where $t=0$ in the direction of increasing $t$.
6. Let $f(x, y)=x^{2} y+x \sin y-\ln \left(x-y^{2}\right)$.
(a) Find $f_{y}(x, y)$.
(b) Find $f_{x y}(x, y)$.

