Math 126 C - Spring 2007
Mid-Term Exam Number Two
May 10, 2007

Name: ______________________________ Section: ____________

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- 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.

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1. Consider the curve defined by the vector equation

$$\overrightarrow{r}(t) = \langle 4t, 5t^3, 2t^2 \rangle$$

(a) Find the unit tangent vector $\overrightarrow{T}(t)$ at the point where $t = 1$.

(b) Find the parametric equations of the tangent line the curve at the point where $t = 1$.

2. Does the curve defined by the polar equation

$$r = \sec\theta + \tan\theta$$

intersect the vertical line $x = 2$? Explain.

3. Suppose a particle is moving in 3-dimensional space so that its position vector is

$$\overrightarrow{r}(t) = \langle t, t^2, \frac{1}{t} \rangle.$$

(a) Find the tangential component of the particle's acceleration vector at time $t = 1$.

(b) Find all values of t at which the particle's velocity vector is orthogonal to the particle's acceleration vector.

4. Consider the curve in the xy-plane defined by the position vector function

$$\overrightarrow{r}(t) = \langle t^2 - 3t, t^2 + 2t \rangle$$

Find the t-value of the point of maximum curvature on this curve.

5. Let $f(x, y) = xe^y - \ln(x + y)$.

(a) Sketch the domain of f.

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