Math 126 - Winter 2009
Mid-Term Exam Number Two
February 24, 2009

Instructor: E. Milakis

Name: ______________________________ Section: ______________

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

- Complete all questions.
- Please BOX your final answer.
- 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 need more room, use the back of the previous page and indicate to the reader that you have done so.
- You may use one (single side) hand-written 8.5 by 11 inch page of notes.
- **Show all work for full credit**. Give as many details as possible
- You have 50 minutes to complete the exam.

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1. An object is moving so that its position at time t is given by the vector function

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

Find the tangent component and the normal component of the acceleration $\vec{\alpha}$ at $t = 2$. Then decompose $\vec{\alpha}(1)$ as

$$\vec{\alpha}(1) = \alpha_T \vec{T} + \alpha_N \vec{N}.$$

(Some fractions may appear.)

2. Reparametrize the curve

$$\vec{r}(t) = < \frac{2}{t^2+1} - 1, \frac{2t}{t^2+1}, 1 >$$

with respect to arc length measured from point $(1, 0, 1)$ in the direction of increasing t. Express the reparametrization in its simplest form.

3. Find the tangent plane to the surface given by the graph of

$$f(x, y) = \sqrt{28 - 2x^2 - y^2}$$

at $(2, 2)$. Use the linear approximation to estimate $f(1.95, 2.01)$.

4. Find (if any) the absolute maximum and minimum value of

$$f(x, y) = 3xy^2$$

in $D = \{(x, y) : x \geq 0,\ y \geq 0,\ x^2 + y^2 \leq 9\}$.

5. Let

$$D = \{(x, y) \in I\!R^2 \ s.t. \ 1 \leq x \leq 2, \ lnx \leq y \leq e^x\}.$$

Decide if D is a domain of type I, type II or both. Then compute Area(D).