Math 2401
Spring 2015
Practice Exam 2
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Time Limit: ...

Name : _____

GT Id : _____

TA: _____

This exam contains 2 pages (including this cover page) and 7 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated. Also, sign the Honor Code pledge at the bottom of this page, and follow the instructions below.

- On this exam you may **not** use your books, notes, or any electronic devices other than a calculator.

- **Show all your work.** A correct answer not supported by calculations and/or explanation will receive no credit. An incorrect answer supported by substantially correct calculations and explanation may receive partial credit.

- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.

- If you need more space, use the back of the pages; clearly indicate when you have done so.

Problem	Points	Score
1	0	
2	0	
3	0	
4	0	
5	0	
6	0	
7	0	
Total:	0	

Honor Code Pledge: By signing below, you are verifying that you understand and uphold the Georgia Tech honor code.

Signature: _____

1. (a) Find $\mathbf{T}, \mathbf{N}, \mathbf{B}, \kappa$ and τ for the space curve $\mathbf{r}(t) = 3\sin t\,\mathbf{i} + 3\cos t\,\mathbf{j} + 4t\,\mathbf{k}$.

   (b) Find an equation for the osculation plane of the above curve at $(0, 3, 0)$.

2. (a) Show that $\mathbf{v} = \dot{r}\mathbf{u}_r + r\dot{\theta}\mathbf{u}_\theta$.

   (b) Find the velocity vector in terms of $\mathbf{u}_r$ and $\mathbf{u}_\theta$ if $r = 7\sin 2\theta$ and $\frac{d\theta}{dt} = 2t$.

3. Express the acceleration of the motion $\mathbf{r}(t) = (\cos t + t\sin t)\mathbf{i} + (\sin t - t\cos t)\mathbf{j}$, $t > 0$, in the form $\mathbf{a} = a_T\mathbf{T} + a_N\mathbf{N}$.

4. Let $f(x,y) = \frac{1}{\sqrt{x^2-y+1}}$.

   (a) Find and sketch the domain of f.

   (b) State whether the domain of f is an open region, a closed region, both or neither.

   (c) State whether the domain of f is bounded or unbounded.

   (d) Find an equation for the level curve of f that passes through $(3, 6)$.

5. Evaluate or show that the limit does not exist.

   (a) $\displaystyle\lim_{\substack{(x,y)\to(-2,4) \\ y\neq 4, x\neq x^2}} \frac{\sqrt{y}-2}{x^2y - xy - 4x^2 + 4x}$

   (b) $\displaystyle\lim_{(x,y)\to(1,1)} \frac{x - y^2}{1 - \sqrt{y}}$

6. (a) Show that $\displaystyle\lim_{(x,y)\to(0,0)} \frac{21x^2 + y^2}{\sqrt{x^2 + y^2}} = 0$.

   (b) Find $\displaystyle\lim_{(x,y)\to(0,0)} \left[\frac{(21x^2 + 5y^2)}{\sqrt{x^2 + y^2}} \sin\left(\frac{12}{2x + 7y^4}\right) \right]$ or show that the limit does not exist.

7. (a) For $f(x,y,z) = 3 - \sqrt{7}x + yz + 5x^2 - ye^{y/z}$, compute $f_{zy}(0,1,1)$.

   (b) Find $\partial w/\partial v$ when $u = \pi$ and $v = 0$ if

   $$w = 1 + \sin(2x - y), \quad x = u + \sin v, \quad \text{and} \quad y = uv.$$

   (c) Find $\partial z/\partial x$ at $(0,0,0)$ if $y^3 + z^2 + z\cos x + xe^{yz} = 0$ defines z as a differentiable function of x and y near the origin.