Midterm 1 / 2004.10.13 / Calculus for Applications / MAT 3243

Name: _____

Please show all work and justify your statements. Label sketches, draw conclusions using complete sentences including units, and box your final answers as appropriate.

1. A surface in $\mathbf{R}^3$ is given by $e^{xy} + e^{xz} - 2e^{yz} = 0$. Find an equation for the plane tangent to this surface at $(-1, -1, -1)$.

2. Find a parametric formula for the line tangent to the path $(5\cos(3t), 6t, 5\sin(3t))$ at the point $(5, 0, 0)$.

3. Let $f(x, y, z) = x^2 z$ and $F(x, y, z) = (0, e^{xyz}, 0)$.

   (a) Compute the directional derivative of f along the direction given by $(1, 1, 0)$.
   (b) Compute the curl and the divergence of the vector field $F + \nabla f$.

4. A six inch pizza fresh out of the oven has the temperature distribution $98 - 3x^2 - 2y^2 - 3x$ degrees Celsius (the pizza is centered at the origin). Where is the pizza the hottest? Where should you bite first to minimize the chance of burning your mouth?

5. Suppose $z = f(u, v)$, where $u = 2x - y$ and $v = x + 2y$. Express the partial derivatives of z with respect to x and y in terms of the partial derivatives of f with respect to u and v.

1	2	3	4	5	total (50)	%

Prelim. course grade: %

THE UNIVERSITY OF TEXAS AT SAN ANTONIO