Midterm 1 / 2005.10.13 / 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. Compute the following linear approximations.
   (a) Find an equation for the plane tangent to the surface $2^x \ln z = y \sin(\pi y z)$ at $[2, 1, 1]$.
   (b) Find a parametric formula for the line tangent to $[\cos(\pi t), \sin(\pi t), 2t]$ at $[0, 1, 1]$.

2. Consider the vector field $F(x, y, z) = [x + yz, y + zx, z + xy]$.
   (a) Compute DF and $\nabla \cdot F$.
   (b) Find a scalar potential for F. What conclusion can you make about $\nabla \times F$? Explain.

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

4. For the scalar field $f(x, y) = 2x - 3y + \ln(xy)$ find all critical points and classify them using the Hessian criterion.

1	2	3	4	total (40)	%

Prelim. course grade: %

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