NAME_____

I____II____III____IV____V____VI____VII____VIII____IX____TOTAL _____

March 10 2004 | Mathematics 206a
Multivariable Calculus
Examination #2 | Mr. Haines

(5) I. Give an example of vector field on $\Re^3$.

(10) II. Find the equation of the tangent plane at the point (0, 1, 1) to the surface with equation:

$$x^3 - 5y + 6yz^2 = 1 \quad .$$

(15) III. Suppose $f(x,y,z) = xy^2 + x^2y - z - 5x$ and $\mathbf{a} = (1, 1, 1)$.

A. $\nabla f(x,y,z)$ =

B. $\nabla f(\mathbf{a})$ =

C. The directional derivative of f at **a** in the direction parallel to the line **x**(t)= (t + 1, 3t + 2, 2t + 3) is

(10) IV. Calculate the second-degree Taylor polynomial centered at **a** = (1, 2) of the function $f : \Re^2 \to \Re$ with formula

$$f(x, y) = xy + x^3 \quad .$$

(10)V. If $f(x, y) = x^3 + y^2$, give the Hessian form for f at $(1, 0)$.

(10)VI. For the vector field $\mathbf{F} = \left(xyz, xy^2 + z, 7\right)$

A) div (**F**) =

B) **curl** (**F**) =

(10)VII. Find all critical points of $f(x, y) = x^2 + y^2 - 4x$. Use the Second Derivative Test to determine whether each critical point is a local minimum, a local maximum, or neither.

(10)VIII. Suppose you learn that the Jacobian of a function $\boldsymbol{f}$ at **a** is the matrix

$$\begin{bmatrix} 1 & 3 & 2 \\ 0 & 1 & 4 \end{bmatrix}.$$

Give a formula for $(\mathbf{D}\boldsymbol{f}(\mathbf{a}))(\mathbf{x})$ using no more than the symbols *s, t, u, v, w, x, y, z*, commas, and parentheses. Note: You don't have to use all of the symbols!

(10) IX. Suppose $f(x,y,z) = (y,z,x)$ and $g(s,t) = (st, s-t, s+t)$ Use the chain rule to find the derivative of f o **g** at the point (3, 2).