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I______II______III______IV______V______VI______VII______ TOTAL ___________

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Mathematics 206a
Multivariable Calculus
Examination #2

Mr. Haines

(11) I. Find the maximum and minimum values of the function

$f(x, y) = 1 + x - y$ on the set $[0,1] \times [0,1]$.

(21) II. Suppose $f(x, y, z) = x^2 y^3 + xy - z - 3y$ and $\mathbf{a} = (1, 1, 1)$.

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

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

C. The directional derivative of f at $\mathbf{a}$ in the direction parallel to $\mathbf{x} = (1, 2, 3)$ is

(28) III. Suppose $\boldsymbol{f} : \Re^3 \to \Re^3$ such that

$$\boldsymbol{f}(x, y, z) = (y, x^2, z) \text{ for all } (x, y, z) \in \Re^3 \text{ and that } \mathbf{a} = (1, 2, 3) .$$

A. The Jacobian matrix of **f** at **a** ,

Jf(**a**) =

B. The (total) derivative of **f** at **a** ,

(**Df**(**a**))(x, y, z) =

C. **curl f**(**a**) =

D. div **f**(**a**) =

(10) IV. Find the equation of the tangent plane at the point (0, -1, 1) to the surface whose equation is

$$x^2 + 8y + 6z^2 = -2$$

(10) V. Calculate the Second Taylor polynomial at $\mathbf{a} = (1, 2)$ of the function $f : \Re^2 \to \Re$ with formula

$$f(x, y) = x^3 + y^3$$

(10) VI. The point (0, 2) is a critical point of $f(x,y) = 2x^2 + x^2 y + y^2 - 4y$. Use the Second Derivative Test to determine whether (0, 2) is a local minimum, a local maximum, or neither.

(10) VII. Suppose $f(x,y,z) = x + y^2 - z^3$ and $g(s,t) = (st, s-t, s+t)$ Use the chain rule to find the derivative of f o **g** at the point (1, 1).