NAME____

I____II____III____IV____V____VI____VII____VIII____ IX____ X____ TOTAL __________
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March 12, 2009	Mathematics 206a Multivariable Calculus Examination #2	Mr. Haines

(10) I. Let C be the curve parametrized by $\bar{f}(t) = \left(t, \frac{2\sqrt{2}}{3} t^{\frac{3}{2}}, \frac{t^2}{2} \right)$ starting at t = 0 and ending at t = 2 . Give an equation for the plane that passes through $\bar{f}(1)$ and is perpendicular to the tangent to C at that point.

(10) II. For the vector field $\mathbf{F}(x, y, z) = (xy, -\sin z, 1)$, compute

A. div (**F) =**

B. curl (**F) =**

(10) III. Find the equation of the plane tangent to the graph of $z = x^2 + y^4 + e^{xy}$ at the point (1, 0, 2) .

(10) IV. Derivatives

A. Suppose $\mathbf{f}(x, y, z) = (x + z + y, x^2)$ and **a** = (1, 1, 0). Calculate the total derivative of **f** at **a** .

B. Suppose $\mathbf{g} : \Re \to \Re^3$ with rule $\mathbf{g}(t) = (6t^2, 3t^3, t)$ and f:$\Re^3 \to \Re$ with rule xyz . Use the Chain Rule to calculate $(f \circ \boldsymbol{g})'(1)$ **.**

(10) V. Find the critical points of $f(x, y, z) = x^2 + y^2 + z^2 - x - y - 2z + 1$ and determine whether they are local maxima, local minima, or saddle points.

(10) VI. If $f : \Re^3 \to \Re$ has rule $f(x, y.z) = x^2 e^{-yz}$, calculate the rate of change of f at (1, 0, 0) in the direction parallel to the vector **i** + **j** + **k**.

(10) VII. Suppose $f:\Re^3 \to \Re$ with rule $f(x, y, z) = \sin(x + 2y + 3z)$.

A. Give $p_1(\mathbf{x})$, the first Taylor Polynomial of *f* at (0, 0, 0).

B. Give $p_2(\mathbf{x})$, the second Taylor Polynomial of *f* at (0, 0, 0).

(10) VIII. If S is the solid below the surface $z = 4 - x^2 - y^2$ and above the *x*-*y* plane, set up but do not evaluate an iterated integral whose value is the triple integral $\iiint_S f(x, y, z)dV$.

(10) IX. Suppose C is the closed parametrized by $\boldsymbol{f}\,(t) = (3\cos t, 3\sin t)$ starting at t $= 0$ and ending at t = 2π.

A. If $F : \Re^2 \rightarrow \Re$ with $F(x, y) =$ x + y , Compute $\int_C F dL$.

B. If $\mathbf{F} : \Re^2 \rightarrow \Re^2$ with $\mathbf{F}(x, y) =$ x$\mathbf{i}$ + y$\mathbf{j}$. Compute $\int_C \vec{F} \bullet d\vec{x}$.

(10) X. Evaluate the iterated integral and draw the region in the plane determined by the limits on the integral.

$$\int_0^{\frac{\pi}{2}} \int_0^{\cos x} y \sin x \, dy \, dx \ .$$