Quiz 2b for Calculus ++, Math 2605 J1-2, September 11, 2007

Name:

This quiz is to be taken without calculators and notes of any sorts. The allowed time is 20 minutes. Provide exact answers; not decimal approximations! For example, if you mean $\sqrt{2}$ do not write $1.414\ldots$.

Consider the function $f(x, y) = xy + x^3$.

I: (3 points) Find the equation of the plane that is tangent to the graph of f at the point $(1, 2)$.

II: (3 points) Find the line that is tangent to the level curve of the function f at the point $(1, 2)$.

III: (2 points) Find the rate of change of the function $f(x, y)$ at the point $(1, 2)$ in the direction $(2, 2)$.

IV: (2 points) Find all the critical points of the function $f(x, y)$.

Extra credit: (3 points) Find the curvature of the function f, i.e., the

second derivative at $t = 0$ of the function $g(t) = f(\mathbf{x_0}+t\mathbf{v})$ where $\mathbf{x_0} = (1, 2)$ and $\mathbf{v} = (2, 1)$.