Quiz 2 for Math 2605B1-2, Fall 2004

Name:

This quiz is to be taken without 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

$$f(x,y) = 3 - \frac{x^2}{4} - y^2 \ .$$

Think of the graph of f as a a mountain, so that $z = f(x,y)$ is your altitude at the point (x,y).

I: (4 points) Find an equation for the tangent plane to the graph of $z = f(x,y)$ at at the point $\mathbf{x}_0 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$.

II: (3 points) Find the tangent line to the level curve of f that passes through the point $\mathbf{x}_0 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$. Give the line in parametric form.

III: (3 points) You stand at the point $\mathbf{x}_0$, and walk due East with a speed of 2 meters per second, so that your velocity vector is $\begin{bmatrix} 2 \\ 0 \end{bmatrix}$. What is the rate of change of your altitude?

Extra credit: The tangent plane that you computed in problem I intersects the plane $z = 1$ in a line. Give the line in parametric form.