QUIZ 5

1. Find plane tangent to the graph of $f(x,y) = x^2 + y^3 - 1$ at the point $(0,2,7)$.

soln:

$$z = f(x_0,y_0) + \nabla f(x_0,y_0) \cdot (x-x_0, y-y_0)$$
$$= 7 + (2(0), 3(2)^2) \cdot (x-0, y-2)$$
$$= 7 + 12(y-2)$$

$$\boxed{z = 7 + 12(y-2)}$$

side work:

$\frac{\partial f}{\partial x} = 2x$

$\frac{\partial f}{\partial y} = 3y^2$

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2. If $\vec{r}(t)$ parametrizes the level set $f(x,y) = c$, show that for every point $(x_0,y_0) = \vec{r}(t_0)$ on the ~~graph~~ level set we have $\nabla f(x_0,y_0)$ & $\vec{r}\,'(t_0)$ perpendicular.

soln: Since $\vec{r}(t)$ parametrizes the level set $f(x,y) = c$ we have $f(\vec{r}(t)) = c$ for every t.

$$\Rightarrow \frac{d}{dt}\left[f(\vec{r}(t))\right] = \nabla f(\vec{r}(t)) \cdot \vec{r}\,'(t) = 0$$

plug in to.

↑ By chain rule

↑ since the function is constant.