Quiz 3

Be sure to follow the quiz instructions in order to avoid a deduction in points. Submissions are due in Gradescope by 11:59pm on Friday; no late work is accepted.

Name:

Question #1: Let $f(x, y, z) : \mathbb{R}^3 \to \mathbb{R}$ and $\mathbf{r}(s, t) : \mathbb{R}^2 \to \mathbb{R}^3$, (a) give the general formula for $\frac{\partial f}{\partial s}$. Next, suppose f is the function $f(x, y, z) = x^2 y + \sin z$ and r is the function

$$\mathbf{r}(s, t) = \begin{bmatrix} s + 1 \\ s^2 t \\ \ln(1 + st) \end{bmatrix}.$$

and (b) use the Chain Rule to evaluate $D(f(\mathbf{r}(s, t)))|_{(s,t)=(1,0)}$.
Note: you do not need [J] for part (a).

(a)

Question #2: Use the Implicit Differentiation formula from lecture to compute $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ for the cone $x^2 + y^2 = z^2$.

Question #3: Sketch the curve $x^2 + y = 1$ together with (a) the vector $\nabla f|_P$ and (b) the tangent line at $P(\sqrt{2}, -1)$. Be sure to label the axes, the coordinates of the point P and the gradient vector $\nabla f|_P$, as well as the tangent line with the equation that defines it.