Quiz 5
Math 253

Name: Key

10/01/19

1. Compute $\frac{\partial f}{\partial x}(-1,2)$ and $\frac{\partial f}{\partial y}(-1,2)$ for the function

$$f(x,y) = e^{-x^2}\cos(\pi y) + \frac{3}{1+xy^2}.$$

$$\frac{\partial f}{\partial x}(-1,2) = -2xe^{-x^2}\cos(\pi y) - \frac{3y^2}{(1+xy^2)^2}\Bigg|_{(-1,2)}$$

$$= 2e^{-1}\underbrace{\cos(2\pi)}_{1} - \frac{3\cdot 4}{(1-4)^2}$$

$$= \frac{2}{e} - \frac{4}{3}$$

$$\frac{\partial f}{\partial y}(-1,2) = e^{-x^2}(-\sin(\pi y)\pi) - \frac{3(2xy)}{(1+xy^2)^2}\Bigg|_{(-1,2)}$$

$$= e^{-1}(-\pi\underbrace{\sin(2\pi)}_{0}) + \frac{3\cdot 4}{(1-4)^2} = \frac{4}{3}$$

2. Explain why the following limit does *not* exist:

$$\lim_{\langle x,y\rangle\to\langle 0,0\rangle} \frac{y^2}{x^2+y^2}$$

Taking the limit along the x-axis (so $y=0$)

$$\frac{y^2}{x^2+y^2} = \frac{0}{x^2} = 0 \rightarrow 0$$

Taking the limit along the y-axis (so $x=0$)

$$\frac{y^2}{x^2+y^2} = \frac{y^2}{y^2} = 1 \rightarrow 1$$

Since these limits are different, there is no one value that $\frac{y^2}{x^2+y^2}$ approaches.