Solutions

Mat 397 Spring 2016 Quiz 5 Name: Caleb McWhorter **Score:** ___/10

1. For each of the following limits either compute its value, or show that it does not exist

(a) $\lim\limits_{(x,y)\to(2,3)} \dfrac{x^2+2y^2}{x^2-y+1}$

This is continuous in its domain - which includes $(2,3)$. So

$$\lim_{(x,y)\to(2,3)} \frac{x^2+2y^2}{x^2-y+1} = \frac{2^2+2(3)^2}{2^2-3+1} = \frac{4+18}{2} = 11$$

(b) $\lim\limits_{(x,y)\to(0,0)} \dfrac{x^2+3y^2}{x^2+y^2}$

x-axis $(y=0)$: $\lim\limits_{(x,0)\to(0,0)} \dfrac{x^2+0}{x^2+0} = 1$

y-axis $(x=0)$: $\lim\limits_{(0,y)\to(0,0)} \dfrac{0+3y^2}{0+y^2} = 3$

Therefore, the limit does not exist.

2. If $f(x,y) = xe^{xy} + \sin x$ compute the following:

(a) $\dfrac{\partial f}{\partial x} = xye^{xy} + e^{xy} + \cos x = e^{xy}(1+xy) + \cos x$

(b) $\dfrac{\partial^2 f}{\partial y \partial x} = xe^{xy}(1+xy) + xe^{xy} = xe^{xy}(2+xy)$

OR

$$\frac{\partial}{\partial y}\left(xye^{xy} + e^{xy} + \cos x\right) = xe^{xy} + x^2ye^{xy} + xe^{xy}$$
$$= 2xe^{xy} + x^2ye^{xy}$$