Math 2401 (K1-K3)
2/4/2015

Quiz 3

(4 pts) **1.** Find the *domain* of the function:

$$f(x,y) = \frac{1}{\ln(8-2x^2-2y^2)}.$$

Sketch the domain.

(3 pts.) **2.** Find the limit, if it exists:

$$\lim_{(x,y)\to(0,0)} \frac{x^2-y^2}{x^2+y^2},$$

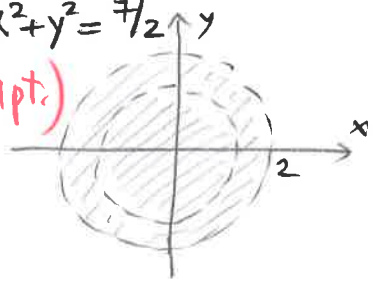
or otherwise show that the limit does not exist.

(3 pts.) **3.** Find the limit, if it exists:

$$\lim_{(x,y)\to(1,2)} \frac{x^2-2x+1}{xy-y},$$

or otherwise show that the limit does not exist.

(1) $\begin{cases} 8-2x^2-2y^2>0 \text{ (1pt.)} & x^2+y^2<4 \text{ (1/2pt.)} \\ 8-2x^2-2y^2\neq 1 \text{ (1pt.)} & x^2+y^2\neq 7/2 \text{ (1/2pt.)} \end{cases}$ Domain: Interior of the disk $x^2+y^2=4$ except the circle $x^2+y^2=7/2$ (1pt.)



(2) $y=kx$ (linear paths)

$$\frac{x^2-k^2x^2}{x^2+k^2x^2} = \frac{1-k^2}{1+k^2} \xrightarrow{x\to 0} \frac{1-k^2}{1+k^2}$$

$\Rightarrow$ Limit does not exist by the Two-Path Test. (3pts.)

(3) $\lim_{(x,y)\to(1,2)} \frac{x^2-2x+1}{xy-y} = \lim_{(x,y)\to(1,2)} \frac{(x-1)^2}{y(x-1)}$ (1pt.) $= \lim_{(x,y)\to(1,2)} \frac{x-1}{y}$ (1pt.) $= \boxed{0}$ (1pt.)