

Quiz 7

MATH 210, CALCULUS III, SUMMER 2015

NAME:

Problem 1. Use the Two-Path Test to prove that the following limit does not exist

$$\lim_{(x,y) \rightarrow (0,0)} \frac{4xy}{3x^2 + y^2}$$

Let $y = mx$

$$L = \lim_{(x,y) \rightarrow (0,0)} \frac{4xy}{3x^2 + y^2} = \lim_{x \rightarrow 0} \frac{4x(mx)}{3x^2 + (mx)^2} = \lim_{x \rightarrow 0} \frac{4x^2 m}{3x^2 + m^2 x^2}$$
$$= \lim_{x \rightarrow 0} \frac{\cancel{x^2} \cdot 4m}{\cancel{x^2} (3 + m^2)} = \lim_{x \rightarrow 0} \frac{4m}{3 + m^2} = \frac{4m}{3 + m^2}$$

For $m = 1$

$$L = \frac{4(1)}{3 + (1)^2} = \frac{4}{4} = 1$$

For $m = -1$

$$L = \frac{-4}{3 + (-1)^2} = -1$$

So by the
2 path test,
the limit
DNE

Problem 2. Verify that $f_{xy} = f_{yx}$ for $f(x, y) = 2x^3 + 3y^2 + 1$.

$$f_x = 6x^2$$

$$f_{xy} = 0$$

$$f_y = 6y$$

$$f_{yx} = 0 \quad \checkmark$$