MATH 104: WORKSHEET 8

1. Concepts

(1) Limit and continuity

If $f(x,y) \to L_1$ as $(x,y) \to (a,b)$ along a path C_1 and $f(x,y) \to L_2$ as $(x,y) \to (a,b)$ along a path C_2, where $L_1 \neq L_2$, then

$$\lim_{(x,y)\to(a,b)} f(x,y) \text{ does not exist.}$$

2. Discussions

Question 1. Do the limits below exist?

(1)

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

(2)

$$\frac{xy}{x^2+y^2}$$

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(3)

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