

Partial Differentiation
Limits

Question

Evaluate the given limit. If the limit does not exist, explain why.

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

Answer

$\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 + y^2}{y}$ does not exist.

If $(x, y) \rightarrow (0, 0)$ along $x = 0$ then $\frac{x^2 + y^2}{y} = y \rightarrow 0$

If $(x, y) \rightarrow (0, 0)$ along $y = x^2$ then $\frac{x^2 + y^2}{y} = 1 + x^2 \rightarrow 1$