

**Partial Differentiation**  
***Limits***

**Question**

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

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

**Answer**

$$\begin{aligned} & \text{If } x = 0 \text{ and } y \neq 0 \\ \Rightarrow \frac{x^2 y^2}{2x^4 + y^4} &= 0 \\ & \text{If } x = y \neq 0 \\ \Rightarrow \frac{x^2 y^2}{2x^4 + y^4} &= \frac{x^4}{2x^4 + x^4} = \frac{1}{3} \end{aligned}$$

$$\Rightarrow \lim_{(x,y) \rightarrow (0,0)} \frac{x^2 y^2}{2x^4 + y^4} \text{ Does not exist.}$$