

Continuous Functions

1. Show that the following function is continuous at the origin.

$$f(x,y) = \begin{cases} \frac{x^2 y^2}{x^2 + y^2} & (x,y) \neq 0 \\ 0 & (x,y) = 0 \end{cases}$$

2. Show that the following function is not continuous at the origin.

$$f(x,y) = \begin{cases} \frac{xy}{x^2 + y^2} & (x,y) \neq 0 \\ 0 & (x,y) = 0 \end{cases}$$

3. Show that the following function is not continuous at the origin.

$$f(x,y) = \begin{cases} \frac{x^2 y}{x^4 + y^2} & (x,y) \neq 0 \\ 0 & (x,y) = 0 \end{cases}$$