

$f(x, y) = (xy \cos y)/(6x^2 + y^2)$. On the x -axis, $f(x, 0) = 0$ for $x \neq 0$, so $f(x, y) \rightarrow 0$ as $(x, y) \rightarrow (0, 0)$ along the x -axis. Approaching $(0, 0)$ along the line $y = x$, $f(x, x) = (x^2 \cos x)/7x^2 = \frac{1}{7} \cos x$ for $x \neq 0$, so $f(x, y) \rightarrow \frac{1}{7}$ along this line. Thus the limit does not exist.