MATB41 WEEK 4 QUIZ 1 LEC02

Question 1

$$f(x,y) = \begin{cases} \dfrac{xy^3}{x^2+y^2} & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$$

Let $g(x,y) = \dfrac{\partial f}{\partial x}$ and $k(x,y) = \dfrac{\partial f}{\partial y}$.

1. At $\vec{a} = (x,y) = (0,0)$, find $\dfrac{\partial}{\partial y}\left(\dfrac{\partial f}{\partial x}\right)$ and $\dfrac{\partial}{\partial x}\left(\dfrac{\partial f}{\partial y}\right)$. Are they equal?
2. Is $f(x,y)$ C^2 at $\vec{a} = (0,0)$?

Strategy:

You may assume that at $\vec{a} = (0,0)$: $\dfrac{\partial f}{\partial x} = 0$ and $\dfrac{\partial f}{\partial y} = 0$