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MAC 2313.3118
Cyr

Quiz 5
You must show all work to receive full credit!!

Problem 1. (4 pts) Let $f(x, y) = \ln(x^3 + y^3)$. Evaluate $f_x(2, 4)$ and $f_{xy}(-1, -2)$.

$$f_x(x,y) = \frac{3x^2}{x^3+y^3} \Rightarrow f_x(2,4) = \frac{3(2)^2}{2^3+4^3} = \frac{12}{8+64} = \frac{12}{72} = \boxed{\frac{1}{6}}$$

$$f_{xy}(x,y) = \frac{\partial}{\partial y} f_x(x,y) = \frac{-(3x^2)(3y^2)}{(x^3+y^3)^2} = \frac{-9x^2y^2}{(x^3+y^3)^2}$$

$$\Rightarrow f_{xy}(-1,-2) = \frac{-9(-1)^2(-2)^2}{((-2)^3+(-1)^3)^2} = \frac{-9\cdot 4}{(-8-1)^2} = \frac{-36}{81} = \boxed{\frac{-4}{9}}$$

Problem 2. (6 pts) Let $g(x, y) = \dfrac{xy}{x^2 + y^2}$.

(a) Evaluate $\lim\limits_{(x,y)\to(0,0)} g(x, y)$ along the x-axis.

Along x-axis, $\lim\limits_{(x,0)\to(0,0)} g(x,0) = \lim\limits_{x\to 0} \dfrac{0}{x^2} = \boxed{0}$

(b) Evaluate $\lim\limits_{(x,y)\to(0,0)} g(x, y)$ along the y-axis.

Along y-axis, $\lim\limits_{(0,y)\to(0,0)} g(0,y) = \lim\limits_{y\to 0} \dfrac{0}{y^2} = \boxed{0}$

(c) Can you conclude that $\lim\limits_{(x,y)\to(0,0)} g(x, y)$ exists? Why or why not?

No; we have only shown that 2 paths have the same limit.
For $\lim\limits_{(x,y)\to(0,0)} g(x,y)$ to exist, it must be 0 along every possible path.