

MATH2850 - Elementary Multivariable Calculus, Spring 2014

Quiz 4 -- solution

Feb 4, 2014

Printed NAME

- You have 15 min to complete your quiz
- Please show all your work neatly and indicate your final answers clearly. If you simply write down the final answer without appropriate intermediate steps, you may not get full credit for that problem
- The quiz is closed book and notes **Calculators are not allowed.**

GOOD LUCK :)

1. Show that the

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

doesn't exist

$\lim_{(x,y) \rightarrow (0,0)} \frac{x^4 - y^2}{x^4 + y^2} = \frac{0}{0}$. The function $\frac{x^4 - y^2}{x^4 + y^2}$

cannot be further simplified. Use two path test to show that the limit doesn't exist

take $y = kx^2$, $\lim_{(x,y) \rightarrow (0,0)} \frac{x^4 - k^2 x^4}{x^4 + k^2 x^4} = \lim_{(x,y) \rightarrow (0,0)} \frac{1 - k^2}{1 + k^2} = \frac{1 - k^2}{1 + k^2}$

So the limit depend on the path - Thus, it doesn't exist.

2. Compute the first order partial derivatives of

$$u = x \ln(x^2 + y^2)$$

$$\frac{\partial u}{\partial x} = \ln(x^2 + y^2) + x \cdot \frac{1}{x^2 + y^2} \cdot 2x = \ln(x^2 + y^2) + \frac{2x^2}{x^2 + y^2}$$

$$\frac{\partial u}{\partial y} = x \cdot \frac{1}{x^2 + y^2} \cdot 2y = \frac{2xy}{x^2 + y^2}$$