MATH102: QUIZ VI

Name:
Student Number:
Section: 4
Date: March 25, 2009

Question:
A function of two variables $f(x, y)$ is continuous and has partial derivatives everywhere. Let $f(a, 0) = \cos a$ and $f(0, b) = 2b + 1$ where a and b are any real numbers. Find $f_x(0, 0)$ and $f_y(0, 0)$.

Solution: We find that $f(0, 0) = 1$. Then

$$f_x(0,0) = \lim_{h\to 0} \frac{f(h,0) - f(0,0)}{h} = \lim_{h\to 0} \frac{\cos h - 1}{h} = \lim_{h\to 0} (-\sin h) = 0,$$

$$f_y(0,0) = \lim_{h\to 0} \frac{f(0,h) - f(0,0)}{h} = \lim_{h\to 0} \frac{(1+2h) - 1}{h} = \lim_{h\to 0} \frac{2h}{h} = 2.$$

CAUTION: In the problem $f(x, y)$ can not be found. Its values on the $x-$ axis ($y = 0$) and on the $y-$ axis ($x = 0$) are given. From these values you give $f(x, y) = \cos x + 2y$ or $f(x, y) = \cos x(2y + 1)$. None of these are correct. It is not possible to find $f(x, y)$ from $f(x, 0)$ and $f(0, y)$. The only way to find these derivatives is to use the above limit definitions of partial derivatives