KFUPM – Calculus III – Quiz 3 – Fall 2010

ID Number: K E Y SECTION:

(.5 perc) **Problem 1:** Is the following function continuous everywhere? Justify your answer.

$$f(x,y) = \begin{cases} \frac{xy^2}{x^2+y^4} & \text{for } (x,y) \neq (0,0) \\ 0 & \text{for } (x,y) = (0,0) \end{cases}$$

It's enough to find one path that gives me a limit different than 0. Let's take the path $x = y^2$. Then:

$$\lim_{(x,y)\to(0,0)} \frac{xy^2}{x^2+y^4} = \lim_{y\to 0} \frac{y^4}{y^4+y^4} = \frac{1}{2}$$

(.5 perc) **Problem 2:** Find an equation for the tangent plane of the function $f(x,y) = xy\ln(x-y)$ at the point (e, 0, 0).

$z = f(e,0) + f_x(e,0)(x-e) + f_y(e,0)y$ with $f(e,0) = 0, f_x(e,0) = 0, f_y(e,0) = e,$

therefore $z = ey$.

(.5 perc) **Problem 3:** Use linear approximation of the function $f(x,y) = \sqrt{13 - 2x^2 - 2y^2}$ at (1,1) to get an approximate value of $f(1.01, 0.98)$.

$$L(x,y) = f(1,1) + f_x(1,1)(x-1) + f_y(1,1)(y-1) \text{ with } f(1,1) = 3, f_x(1,1) = f_y(1,1) = -\frac{2}{3},$$

$$\text{hence } L(1.01, 0.98) = 3 - \frac{2}{3}(0.01) - \frac{2}{3}(-0.02) = \frac{900}{300} - \frac{2}{300} + \frac{4}{300} = \frac{902}{300}$$