Math 201 — Quiz 6

Date 02/04/2012

Ex1: Let $f(x,y) = \ln(x-3y)$

a) Find the linear approximation of $f(x,y)$ at $(7,2)$

b) Use a) to approximate $f(6.9, 2.06)$

Solution: a) $f(x,y) \approx f(7,2) + f_x(7,2)(x-7) + f_y(7,2)(y-2)$.

Now: $f_x(x,y) = \dfrac{1}{x-3y}$. So $f_x(7,2) = 1$

and $f_y(x,y) = \dfrac{-3}{x-3y}$, So $f_y(x,y) = -3$.

Therefore $f(x,y) \approx x-7-3(y-2)$

b) $f(6.9, 2.06) \approx (6.9-7) - 3(2.06-2)$

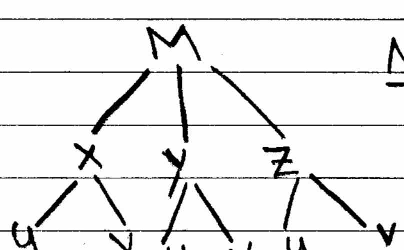
$\approx -0.1 - 0.18$

≈ -0.28

Ex2: Let $M = xe^{y-z^2}$, with $x = 2uv$, $y = u-v$ and $z = u+v$.

Use the Chain rule to find $\dfrac{\partial M}{\partial u}$.

Solution: By the Chain rule: $\dfrac{\partial M}{\partial u} = \dfrac{\partial M}{\partial x}\dfrac{\partial x}{\partial u} + \dfrac{\partial M}{\partial y}\dfrac{\partial y}{\partial u} + \dfrac{\partial M}{\partial z}\dfrac{\partial z}{\partial u}$



Now: $\dfrac{\partial M}{\partial x} = e^{y-z^2}$ and $\dfrac{\partial x}{\partial u} = 2v$

$\dfrac{\partial M}{\partial y} = xe^{y-z^2}$ and $\dfrac{\partial y}{\partial u} = 1$

$\dfrac{\partial M}{\partial z} = -2xze^{y-z^2}$ and $\dfrac{\partial z}{\partial u} = 1$

Hence $\dfrac{\partial M}{\partial u} = (2v + x - 2xz)\, e^{y-z^2}$