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October 6, 2016
MAC 2313.9722
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Quiz 6
You must show all work to receive full credit!!

Problem 1. (5 points) Find an equation of the tangent plane to $f(x,y) = xy^{-2}$ at the point $(-4,2)$, and use it to approximate $f(-4.4, 2.2)$.

$f(-4,2) = \frac{(-4)}{2^2} = \frac{-4}{4} = -1$

$f_x = y^{-2} \Rightarrow f_x(-4,2) = \frac{1}{2^2} = \frac{1}{4}$

$f_y = -2xy^{-3} \Rightarrow f_y(-4,2) = \frac{-2(-4)}{2^3} = \frac{8}{8} = 1$

$z = f_x(-4,2)(x+4) + f_y(-4,2)(y-2) + f(-4,2)$

$z = \frac{1}{4}(x+4) + (y-2) - 1 \Rightarrow \boxed{z = \frac{1}{4}x + y - 2}$

$f(-4.4, 2.2) \approx \frac{1}{4}(-4.4) + 2.2 - 2 = -1.1 + 0.2 = \boxed{-0.9}$

Problem 2. (5 points) Let $z = \arctan(x^2+y^2)$, $x = u\ln(v), y = ve^u$. Use the chain rule to evaluate the partial derivative $\frac{\partial z}{\partial v}$ at the point $(u,v) = (0,1)$.

$\frac{\partial z}{\partial v} = \frac{\partial z}{\partial x}\cdot\frac{\partial x}{\partial v} + \frac{\partial z}{\partial y}\cdot\frac{\partial y}{\partial v}$ $\qquad (u,v) = (0,1) \Rightarrow (x,y) = (0,1)$

$= \left(\frac{2x}{1+(x^2+y^2)^2}\right)\left(\frac{u}{v}\right) + \left(\frac{2y}{1+(x^2+y^2)^2}\right)\left(e^u\right)$

$\left.\frac{\partial z}{\partial v}\right|_{(0,1)} = \left(\frac{0}{1+1}\right)\left(\frac{0}{1}\right) + \left(\frac{2}{1+1}\right)(e^0) = \frac{2}{2} = \boxed{1}$