(Sorry professor, my printer ran out of black inks)

"QUIZ" for Lecture 8

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1) Find the directional derivative of

$f(x, y, z) = xy^2z^3$ at point: $(2, 1, 1)$ in dir: $\langle 2, -1, -1 \rangle$

$$\nabla f = \langle y^2z^3, 2xyz^3, 3xy^2z^2 \rangle$$

$$\vec{u} = \left\langle \frac{2}{\sqrt{6}}, \frac{-1}{\sqrt{6}}, \frac{-1}{\sqrt{6}} \right\rangle \quad \nabla f(2,1,1) = \langle 1, 4, 6 \rangle$$

$$\nabla f \cdot \vec{u} = \frac{2}{\sqrt{6}} + \left(\frac{-4}{\sqrt{6}}\right) + \left(\frac{-6}{\sqrt{6}}\right) = \boxed{\frac{-8}{\sqrt{6}}}$$

2) Find max r.o.c. of

$f(x, y) = x^2 + y^3$ @ pt $(2, 1)$

& the dir. in which it occurs

$$\nabla f(x, y) = \langle 2x, 3y \rangle$$

$$\nabla f(2, 1) = \langle 4, 3 \rangle$$

$$|\langle 4, 3 \rangle| = 5 \qquad \frac{\nabla f(2,1)}{|\nabla f(2,1)|} = \boxed{\left\langle \frac{4}{5}, \frac{3}{5} \right\rangle}$$