# Quiz 9

Name:

Problem 1 (5 points): Find the derivative of the function

$$f(x, y, z) = xyz^2$$

at $P_0(1, 0, 1)$ in the direction $\mathbf{A} = \mathbf{i} + \mathbf{j} + \mathbf{k}$.

$\dfrac{A}{|A|} = \dfrac{1}{\sqrt{3}} \langle 1, 1, 1 \rangle$

$D_u f = \nabla f \cdot \dfrac{A}{|A|}$

$f_x = yz^2$          $f_z = 2xyz$

$f_x|_{(1,0,1)} = 0$      $f_z|_{(1,0,1)} = 0$

$= \langle 0, 1, 0 \rangle \cdot \langle \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}} \rangle$

$f_y = xz^2$

$= \boxed{\dfrac{1}{\sqrt{3}}}$

$f_y|_{(1,0,1)} = 1$

Problem 2 (5 points): Find the equation for the tangent plane on the given surface

$$x^2 + y^2 - z^2 = 21$$

at point $P_0(4, 3, 2)$.

$f_x = 2x$

$f_x|_{(4,3,2)} = 8$

$f_y = 2y$

Equation for tangent plane :

$f_y|_{(4,3,2)} = 6$

$8(x-4) + 6(y-3) - 4(z-2) = 0$

$f_z = -2z$

$f_z|_{(4,3,2)} = -4$

$\nabla f = \langle 8, 6, 4 \rangle$

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