QUIZ 8 | 6–7 pm

Solutions

① Find $\frac{\partial w}{\partial u}$, where $w = \frac{y}{x} + \ln z$

$x = u-2v+1$, $y = 2u+v$, $z = \cos u$

$$\frac{\partial w}{\partial u} = \frac{\partial w}{\partial x}\frac{\partial x}{\partial u} + \frac{\partial w}{\partial y}\frac{\partial y}{\partial u} + \frac{\partial w}{\partial z}\frac{\partial z}{\partial u}$$

$$= \left(-\frac{y}{x^2}\right)(1) + \left(\frac{1}{x}\right)(2) + \left(\frac{1}{z}\right)(-\sin u)$$

$$= \frac{-2u-v}{(u-2v+1)^2} + \frac{2}{u-2v+1} - \frac{\sin u}{\cos u} = \frac{-2u-v+\cancel{2u}-4v+2}{(u-2v+1)^2} - \tan u$$

$$= \boxed{\frac{-5v+2}{(u-2v+1)^2} - \tan u}$$

② Find the derivative of the function at P_0 in the direction $\vec{A}$

$f(x,y) = x^3 + 2y^2$, $P_0(-1,1)$, $\bar{A} = 3i - 4j$

$$u = \frac{\bar{A}}{|\bar{A}|} = \frac{1}{5}(3,-4)$$

$$D_u f|_{P_0} = \nabla f|_{P_0} \cdot u = (3x^2, 4y)|_{P_0} \cdot \frac{1}{5}(3,-4)$$

$$= (3,4) \cdot \frac{1}{5}(3,-4)$$

$$= \frac{1}{5}(9-16) = \frac{1}{5}(-7) = -\frac{7}{5}$$