

Advanced Mathematics For Practicing Engineers

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PRACTICE SHEET - 4

Partial derivative: Jacobian

① If $u = x(1-y)$, $v = xy$
 Prove that $J \cdot J' = 1$

② If $x^2 + y^2 + u^2 - v^2 = 0$ and $uv + xy = 0$
 Prove that $\frac{\partial(u,v)}{\partial(x,y)} = \frac{x^2 - y^2}{u^2 + v^2}$

③ Use Jacobian to find $\frac{\partial u}{\partial x}$
 If $u^2 + xv^2 - xy = 0$ and $u^2 + xyv + v^2 = 0$

④ If $u = \frac{x}{y-z}$, $v = \frac{y}{z-x}$, $w = \frac{z}{x-y}$
 Show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 0$.

⑤ If $u = \frac{y^2}{2x}$, $v = \frac{x^2 + y^2}{2x}$, prove that
 $\frac{\partial(u,v)}{\partial(x,y)} = -\frac{y}{2x}$.

Answer: Ques 3:- $\frac{\partial u}{\partial x} = \frac{xy^2 + xy^2 - 2v^2 + 2yv}{2xy^2 + 4uv - 4xuv}$

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