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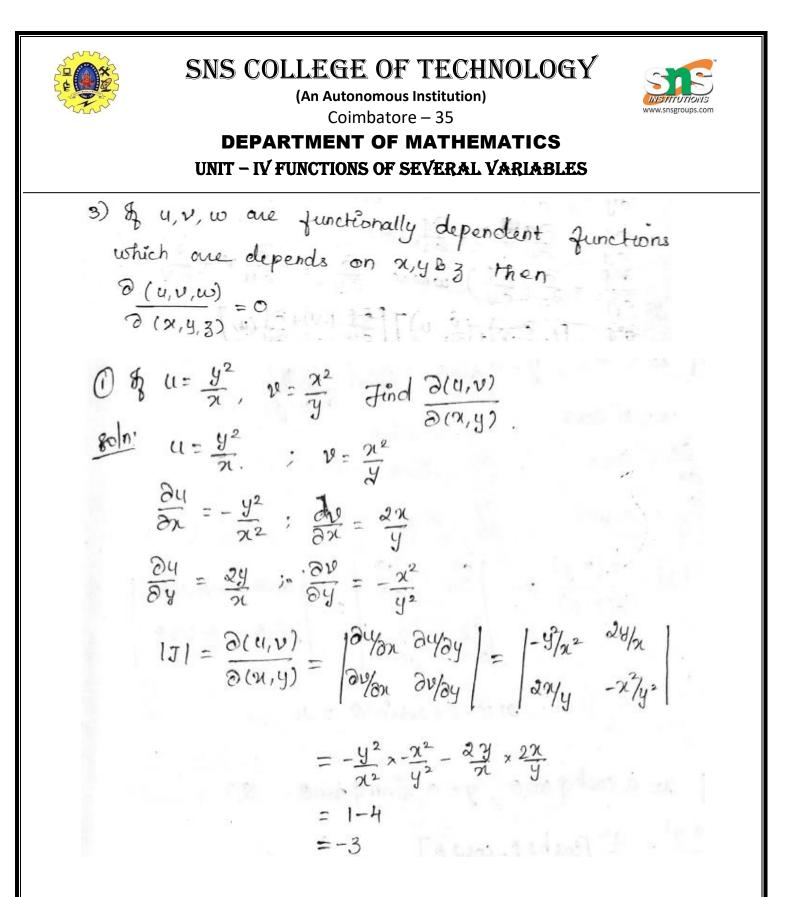
Coimbatore – 35

### **DEPARTMENT OF MATHEMATICS** UNIT – IV FUNCTIONS OF SEVERAL VARIABLES

JACOBIANS 26 u= f(x,y) & v= g(x,y) be the two cts. Junctions  $\gamma \times \& \gamma$  then the functional determinant  $(JJ) = \frac{\partial(u,v)}{\partial(x,y)} = \frac{4}{\sqrt{\frac{\partial u}{\partial x}}} \frac{\partial u}{\partial y}$  is called Jacobians of u and v with respect to n & y. Three functions & three variables  $|J| = \frac{\partial(M, v, w)}{\partial(x, y, 3)} = \begin{vmatrix} \partial y & \partial u & \partial u \\ \partial x & \partial y & \partial z \\ \partial x & \partial y & \partial z \\ \partial x & \partial y & \partial z \\ \partial w & \partial w & \partial w \\ \partial x & \partial y & \partial z \\ \partial w & \partial w & \partial w \\ \partial y & \partial z \\ \partial z & \partial y & \partial z \end{vmatrix}$ roporties ) If u, v are functions of x &y and x, y are functions of r&s then

$$\frac{\partial(u,v)}{\partial(r,s)} = \frac{\partial(u,v)}{\partial(x,y)} \cdot \frac{\partial(x,y)}{\partial(r,s)}$$

2) If 
$$u \not\approx v$$
 one functions  $g \not\propto \& g$  then  
 $\frac{\partial(u,v)}{\partial(x,y)} \frac{\partial(x,y)}{\partial(u,v)} = 1$ 





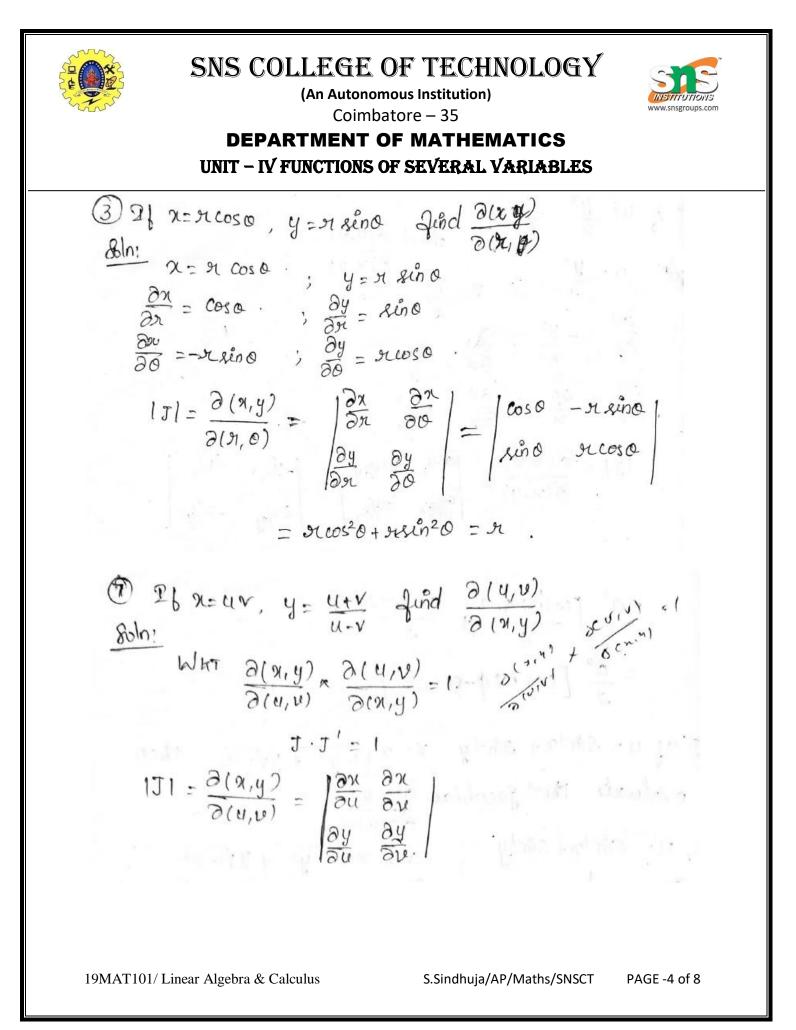


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(2)  $21 u = \frac{y_3}{\pi}, v = \frac{y_3}{y}, w = \frac{x_y}{3}$  Find  $\frac{\partial(u, v, w)}{\partial(x, y, 3)}$  $u = \frac{y_3}{2}$ ;  $v = \frac{3\pi}{y}$ ;  $w = \frac{\pi y}{3}$  $\frac{\partial Y}{\partial n} = -\frac{y_3}{n^2}; \quad \frac{\partial v}{\partial n} = \frac{3}{y}; \quad \frac{\partial w}{\partial n} = \frac{y}{3}$  $\frac{\partial u}{\partial y} = \frac{3}{\pi} ; \frac{\partial v}{\partial y} = -\frac{3\pi}{42} ; \frac{\partial w}{\partial y} = \frac{\pi}{3}$  $\frac{\partial y}{\partial 3} = \frac{y}{\pi} ; \frac{\partial v}{\partial 3} = \frac{\chi}{y} ; \frac{\partial w}{\partial 3} = -\frac{\chi y}{3^2}$  $IJI = \frac{\partial(u, v, w)}{\partial(x, y, 3)} = \begin{vmatrix} \partial u_{\partial x} & \partial u_{\partial y} & \partial u_{\partial 3} \\ \partial v_{\partial x} & \partial u_{\partial y} & \partial v_{\partial 3} \\ \partial w_{\partial x} & \partial w_{\partial y} & \partial w_{\partial 3} \\ \partial w_{\partial x} & \partial w_{\partial y} & \partial w_{\partial 3} \\ \vdots & \vdots & \vdots \\ \frac{\partial}{\partial y} & \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial y} \\ \frac{\partial}{\partial y} & \frac{\partial}{\partial y} & \frac{\partial}{\partial y} \\ \frac{\partial}{\partial y} & \frac{\partial}{\partial y} & \frac{\partial}{\partial y} \\ \frac{\partial}{\partial y} & \frac{\partial}{\partial y} & \frac{\partial}{\partial y} \\ \frac{\partial}{\partial y} \\ \frac{\partial}{\partial y} & \frac{\partial}{\partial y} \\ \frac{\partial}$  $= -\frac{y_3}{x^2} \left[ -\frac{3x}{y^2} \times -\frac{xy}{3^2} - \frac{x}{y} \times \frac{x}{3} \right] - \frac{3}{2} \left[ -\frac{3y}{3^2} \times \frac{y}{3} - \frac{y}{3} \times \frac{y}{3} \right] +$ Y [3 x x - 4 x - 3n] = 4



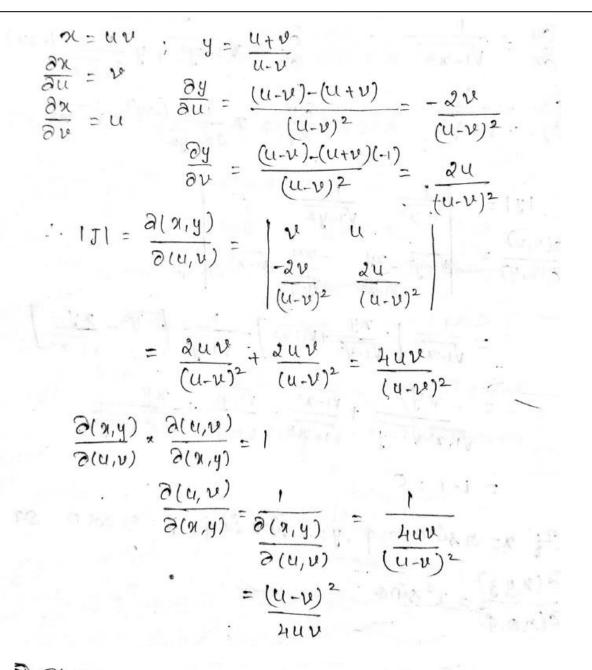


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Def n= n cosa, y= n sina finda(r.a)





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$$\begin{array}{l} \begin{array}{l} \begin{array}{l} \mathcal{Y} & u = 2\pi y \ , \ v = \pi^{2} \cdot y^{2} \ and \ \pi = \pi \cos \theta \ , \ y = \pi \sin \theta \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & u = 2\pi y \ & \frac{\partial (u, v)}{\partial (\pi, 0)} \end{array} \\ \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & u = 2\pi y \ & \frac{\partial (u, v)}{\partial (\pi, 0)} \end{array} \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & u = 2\pi y \ & \frac{\partial (u, v)}{\partial (\pi, 0)} \end{array} \end{array} \\ \begin{array}{l} \mathcal{Y} & u = 2\pi y \ & \frac{\partial (v}{\partial \pi} = 2\pi y \ & \frac{\partial v}{\partial \pi} = 2\pi y \end{array} \\ \begin{array}{l} \begin{array}{l} \frac{\partial (u, v)}{\partial (\pi, 0)} = \ & \frac{\partial v}{\partial \pi} = 2\pi y \ & \frac{\partial v}{\partial \pi} = -2y \end{array} \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & \frac{\partial (u, v)}{\partial (\pi, 0)} \end{array} \\ \begin{array}{l} \mathcal{Y} & \frac{\partial (u, v)}{\partial (\pi, 0)} \end{array} \end{array} = \ & \frac{\partial v}{\partial \pi} = -2y \end{array} \\ \begin{array}{l} \begin{array}{l} \frac{\partial (u, v)}{\partial (\pi, y)} = \ & \frac{\partial v}{\partial \pi} = -2y \end{array} \end{array} \end{array} \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & \frac{\partial v}{\partial \pi} = -2y \end{array} \\ \begin{array}{l} \frac{\partial (u, v)}{\partial (\pi, y)} \end{array} \end{array} = \ & \frac{\partial v}{\partial \pi} = -2y \end{array} \end{array} \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & \frac{\partial v}{\partial \pi} = -2y \end{array} \end{array} \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & \frac{\partial v}{\partial \pi} = -2y \end{array} \end{array} \end{array} \end{array} \\ \begin{array}{l} \begin{array}{l} \mathcal{Y} & \frac{\partial v}{\partial \pi} = -2y \end{array} \end{array} \end{array} \end{array} \\ \begin{array}{l} \frac{\partial (u, v)}{\partial (\pi, y)} \end{array} = \ & \frac{\partial v}{\partial \pi} = \pi \cos \theta \end{array} \\ \begin{array}{l} \frac{\partial v}{\partial \pi} = x \sin \theta \end{array} \\ \end{array} \\ \begin{array}{l} \frac{\partial (u, v)}{\partial \pi} = \cos \theta \end{array} \\ \begin{array}{l} \frac{\partial y}{\partial x} = \pi \cos \theta \end{array} \\ \end{array} \\ \begin{array}{l} \frac{\partial y}{\partial x} = \pi \cos \theta \end{array} \\ \end{array} \\ \begin{array}{l} \frac{\partial y}{\partial x} = \pi \cos \theta \end{array} \\ \end{array} \\ \begin{array}{l} \frac{\partial (u, v)}{\partial (u, 0)} = \end{array} \\ \begin{array}{l} \begin{array}{l} \cos \theta & -\pi \sin \theta \end{array} \end{array} \\ \end{array} \\ \end{array} \end{array}$$
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 $= -4 \Re^{2} \chi \Pi = \Im^{2} .$ i) Si the functions  $u = \frac{\pi}{y} \neq 2^{2} = \frac{\pi + y}{\pi - y}$  one functionally dependent and find the relationship bottom. them.  $\frac{g_{\text{ln}}}{\partial x} = \frac{\chi}{y}; \quad \chi = \frac{\chi + y}{\pi - y}; \quad \chi = \frac{\chi + y}{\pi - y}; \quad \chi = \frac{\chi - y}{(\pi - y)^2} = \frac{-2\chi}{(\pi - y)^2}$  $\frac{\partial u}{\partial y} = -\frac{\chi}{y^2} \qquad \frac{\partial u}{\partial y} = \frac{\chi - y - (\chi + y)(-1)}{(\chi - y)^2} = \frac{\chi}{(\chi - y)^2}$  $\frac{\partial(u, u)}{\partial(n, y)} = \begin{bmatrix} \frac{1}{y} & -\frac{\chi}{y^2} \\ -\frac{2y}{(n-y)^2} & \frac{2\chi}{(n-y)^2} \end{bmatrix}$ . The eyn functions are functionally dependent





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$\underline{q} \underline{n}: u = 2/y,  v = \frac{n+y}{n-y}.$
$\mathcal{V} = \left[\frac{\mathcal{A}}{\mathcal{Y}} + 1\right] \mathcal{Y} \qquad u + 1$
$\overline{[\frac{n}{y}-i]y} = \overline{u-1}$
=) $u = \frac{u+1}{u-1}$
1) ST the durctions U= 271-4+33 18-22-4 7
w= 2n-y+3 are functionally dependent . Tim
outanonship between them.
Relationship: U+v=2w.
Determine whether a Dunching
here is the second s
Ani: 24+ v = w <sup>2</sup> (relectionship)