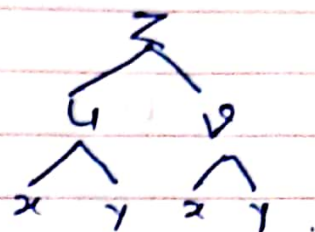


eg. ① If $z = f(u, v)$ where $u = x^2 - 2xy - y^2$
 & $v = y$ show that

$$(x+y) \frac{\partial z}{\partial x} + (x-y) \frac{\partial z}{\partial y} = (x-y) \frac{\partial z}{\partial v}$$

→ $z \rightsquigarrow u, v \rightsquigarrow x, y$



$$\frac{\partial z}{\partial x} = \frac{\partial z}{\partial u} \frac{\partial u}{\partial x} + \frac{\partial z}{\partial v} \frac{\partial v}{\partial x}$$

$$\frac{\partial z}{\partial x} = \frac{\partial z}{\partial u} (2x - 2y)$$

$$(x+y) \frac{\partial z}{\partial x} = 2(x^2 - y^2) \frac{\partial z}{\partial u} \quad \text{--- ①}$$

$$\frac{\partial z}{\partial y} = \frac{\partial z}{\partial u} \frac{\partial u}{\partial y} + \frac{\partial z}{\partial v} \frac{\partial v}{\partial y}$$

$$\frac{\partial z}{\partial y} = \frac{\partial z}{\partial u} (-2x - 2y) + \frac{\partial z}{\partial v}$$

$$(x-y) \frac{\partial z}{\partial y} = -2(x^2 - y^2) + (x-y) \frac{\partial z}{\partial v} \quad \text{--- ②}$$

① + ② gives.

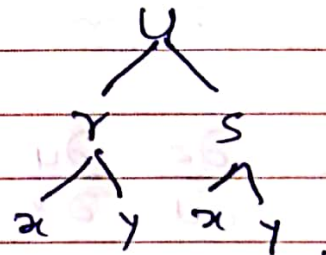
$$(x+y) \frac{\partial z}{\partial x} + (x-y) \frac{\partial z}{\partial y} = (x-y) \frac{\partial z}{\partial v}$$

April	2020						
S	M	T	W	T	F	S	
0	0	0	1	2	3	4	
5	6	7	8	9	10	11	
12	13	14	15	16	17	18	
19	20	21	22	23	24	25	
26	27	28	29	30			

2) IF $u = f(r, s)$ where $r = x^2 + y^2$, $s = x^2 - y^2$
then show that

$$y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 4xy \frac{\partial u}{\partial r}$$

→ $u \rightsquigarrow r, s \rightsquigarrow x, y$



$$\begin{aligned} \frac{\partial u}{\partial x} &= \frac{\partial u}{\partial r} \frac{\partial r}{\partial x} + \frac{\partial u}{\partial s} \frac{\partial s}{\partial x} \\ &= \frac{\partial u}{\partial r} (2x) + \frac{\partial u}{\partial s} (2x) \end{aligned}$$

$$y \frac{\partial u}{\partial x} = 2xy \frac{\partial u}{\partial r} + 2xy \frac{\partial u}{\partial s} \quad \text{--- (I)}$$

$$\frac{\partial u}{\partial y} = \frac{\partial u}{\partial r} \frac{\partial r}{\partial y} + \frac{\partial u}{\partial s} \frac{\partial s}{\partial y}$$

$$\frac{\partial u}{\partial y} = \frac{\partial u}{\partial r} (2y) + \frac{\partial u}{\partial s} (-2y)$$

$$x \frac{\partial u}{\partial y} = 2xy \frac{\partial u}{\partial r} - 2xy \frac{\partial u}{\partial s} \quad \text{--- (II)}$$

① + ② gives

$$y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 4xy \frac{\partial u}{\partial r}$$

अनिर्वाच्या फटली लाजा ।

February							2020
S	M	T	W	T	F	S	
0	0	0	0	0	0	1	
2	3	4	5	6	7	8	
9	10	11	12	13	14	15	
16	17	18	19	20	21	22	
23	24	25	26	27	28	29	

H.W. ① If $u = x^2 - y^2$, $v = 2xy$
 & $z = f(u, v)$ then show that

$$x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y} = 2 \sqrt{u^2 + v^2} \frac{\partial z}{\partial u}$$

② If $u = f(x-y, y-z, z-x)$ then

Find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$