

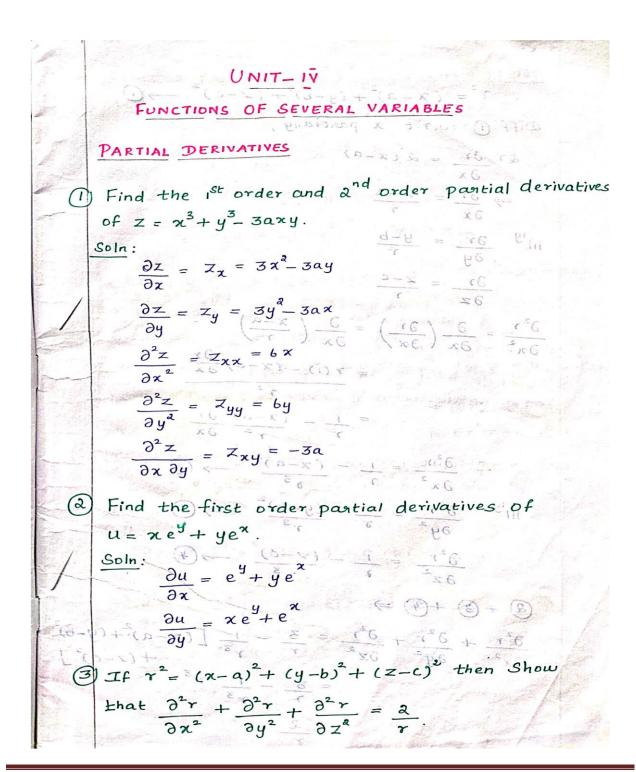
SNS COLLEGE OF TECHNOLOGY



(An Autonomous Institution)

DEPARTMENT OF MATHEMATICS

UNIT IV





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Soln:

$$r^{2} = (x-a)^{2} + (y-b)^{2} + (z-c)^{2} \longrightarrow 0$$

$$\text{Diff } () \text{ w.r.t } x \text{ pantially },$$

$$\frac{\partial r}{\partial x} = \frac{\partial r}{\partial x} = 2(x-a)$$

$$\Rightarrow \frac{\partial r}{\partial x} = \frac{x-a}{r}$$

$$\text{III}^{1/3} \frac{\partial r}{\partial x^{2}} = \frac{y-b}{r}$$

$$\frac{\partial r}{\partial x^{2}} = \frac{z-c}{r}$$

$$\frac{\partial^{2}r}{\partial x^{2}} = \frac{\partial}{\partial x} \left(\frac{\partial r}{\partial x}\right) = \frac{\partial}{\partial x} \left(\frac{x-a}{r}\right)^{2}$$

$$= \frac{r(1) - (x-a)^{2} \frac{\partial r}{\partial x}}{r^{2}}$$

$$= \frac{1}{r} - \frac{(x-a)^{2}}{r^{2}} \frac{\partial r}{\partial x}$$

$$\vdots \frac{\partial^{2}r}{\partial x^{2}} = \frac{1}{r} - \frac{(y-b)^{2}}{r^{3}} \longrightarrow 2$$

$$\frac{\partial^{2}r}{\partial x^{2}} = \frac{1}{r} - \frac{(z-c)^{2}}{r^{3}} \longrightarrow 3$$

$$\frac{\partial^{2}r}{\partial x^{2}} = \frac{1}{r} - \frac{(z-c)^{2}}{r^{3}} \longrightarrow 3$$

$$\frac{\partial^{2}r}{\partial x^{2}} + \frac{\partial^{2}r}{\partial y^{2}} + \frac{\partial^{2}r}{\partial z^{2}} = \frac{z}{r} - \frac{1}{r^{3}} \left[(x-a)^{2} + (y-b)^{2} + (z-c)^{2}\right]$$

$$= \frac{z}{r} - \frac{1}{r^{3}} \cdot r^{3}$$

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If
$$Z = (x^2 + xy + y^2)^T$$
 then Show that
$$(x \frac{\partial}{\partial x} + y \frac{\partial}{\partial y}) (x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y}) = 4r^2 Z.$$

Soln:
$$Z = (x^2 + xy + y^2)^T (2x + y)$$

$$\frac{\partial z}{\partial x} = r(x^2 + xy + y^2)^{T-1} (2y + x)$$

$$\frac{\partial z}{\partial y} = r(x^2 + xy + y^2)^{T-1} (2y + x)$$

$$\frac{\partial z}{\partial y} = r(x^2 + xy + y^2)^{T-1} (2y + x)$$

$$\frac{\partial z}{\partial y} = r(x^2 + xy + y^2)^{T-1} \left[2x + 2y^2 + 2xy\right]$$

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

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

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