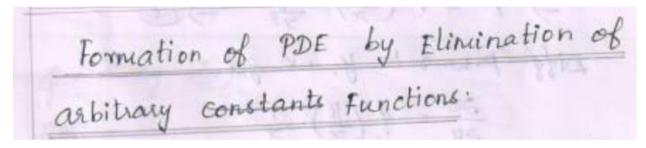




TOPIC: 2 - FORMATION OF PARTIAL DIFFERENTIAL EQUATIONS



$$\varphi(u,u)=0 \Rightarrow \begin{vmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial x} \\ \frac{\partial u}{\partial y} & \frac{\partial u}{\partial y} \end{vmatrix} = 0.$$

Flincinate the arbitrary function of from
$$x = b(\frac{4}{\alpha})$$
 form a PDE. Sol:

Given $z = f(\frac{4}{\alpha})$

Diff p.w. $x \cdot h = x$, we get

$$\frac{\partial z}{\partial x} = f'(\frac{4}{\alpha}) \cdot \frac{-y}{x^2}$$

$$\Rightarrow p = f'(\frac{4}{\alpha}) \cdot \frac{-y}{x^2} \Rightarrow 0$$
Diff p.w. $x \cdot h = y$, we get
$$\frac{\partial z}{\partial y} = f'(\frac{4}{\alpha}) \cdot \frac{1}{\alpha}$$
from (M) . $\Rightarrow q = f'(\frac{4}{\alpha}) \cdot \frac{1}{\alpha}$

$$\Rightarrow q = -\frac{4}{\alpha^2} \cdot \frac{x}{\alpha}$$

$$\Rightarrow px + qy = 0$$





2 =
$$f(xy)$$

Sol:

 $z = f(xy)$
 $z = f(xy)$









5
$$z = xf(2x+y) + g(2x+y)$$

Sol:

 $z = xf(2x+y) + g(2x+y)$

Diff p. w. 7. to x.

 $p = \frac{\partial z}{\partial x} = f(2x+y) + xf'(2x+y) \cdot 2 + g'(2x+y) \cdot 2$
 $q = xf'(2x+y) + g'(2x+y) - x$
 $z = f'(2x+y) \cdot 2 + xf''(2x+y) \cdot 4 + f'(2x+y) \cdot 2$
 $z = f'(2x+y) \cdot 4 + xf''(2x+y) \cdot 4 + f'(2x+y) \cdot 2$
 $z = f'(2x+y) + xxf''(2x+y) + 2g''(2x+y) \cdot 3$
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 $z = xf''(2x+y) \cdot 3$





(b) From the p de by elinainating of from

$$\varphi \left(x^{2}+y^{2}+z^{2}, ax+by+cz \right) = 0.$$
Sol: Jelle $u = x^{2}+y^{2}+z^{2}$ $v = ax+by+cz$.

$$\frac{\partial u}{\partial x} = 2x + 2zp \qquad \frac{\partial v}{\partial x} = a+cp$$

$$\frac{\partial u}{\partial y} = 2y + 2zq \qquad \frac{\partial v}{\partial y} = b+cq.$$

$$\begin{vmatrix} \frac{\partial u}{\partial x} & \frac{\partial v}{\partial x} \\ \frac{\partial v}{\partial y} & \frac{\partial v}{\partial y} \end{vmatrix} = 0$$

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