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Section-2

Q.1

Ans. $x^3 \cdot r - y^2 t + px + qy = \log x$

- let $x = e^X$
  $y = e^Y$

so that, $X = \log x$
$Y = \log y$

and

let $D = \frac{\partial}{\partial X}$ & $D' = \frac{\partial}{\partial X}$ then the given equation reduces to.

$$[D(D-1) - D'(D'-1) + D - D']Z = X \quad \text{—— (1)}$$

$$\Rightarrow \quad [D^2 - D'^2]Z = X$$

Which is a homogeneous linear partial differential eq^n., with constant co-efficients.

$$CF = \phi_1(Y+X) + \phi_2(Y-X)$$

&

$$PI = \frac{1}{D^2 - D'^2}(X) = \frac{1}{(1)^2 - (0)^2}\iint u \, du \, du$$

where,

$$X = u$$

$$= \int \frac{u^2}{2} du = \frac{u^3}{6} = \boxed{\frac{X^3}{6}}$$

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Hence solution to eq^n (1), we get

$$z = \phi_1 (y + x) + \phi_2 (y - x) + \frac{x^3}{6}$$

$$= \phi_1 (\log y + \log x) + \phi_2 (\log y - \log x) + \frac{(\log x)^3}{6}$$

- Therefore the complete solution to the given differential eq^n. is

$$z = \phi_1 (\log xy) + \phi_2 \left(\log \frac{y}{x}\right) + \frac{1}{6} (\log x)^3$$

$$\boxed{z = f_1 (xy) + f_2 (y/x) + \frac{1}{6} (\log x)^3}$$ Ans.

where

f_1 & f_2 are arbitrary functions.