



# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai

Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &

Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)

COIMBATORE-641 035, TAMIL NADU



Type - III Standard type : .

1. Solve  $z = pq$ .

Sol

Given  $z = pq$  — (1).

The given PDE is of the form  $f(z, pq) = 0$

(i) To find the complete integral

put  $u = x + ay$

$$p = \frac{dz}{du} ; q = a \frac{dz}{du}$$



Sub. the values of  $p$  and  $q$  in ①, we get.

$$\frac{dz}{du} \text{ or } \frac{dz}{du} = z.$$

$$a \left( \frac{dz}{du} \right)^2 = z$$

$$\left( \frac{dz}{du} \right)^2 = \frac{z}{a}$$

$$\frac{dz}{du} = \frac{\sqrt{z}}{\sqrt{a}}$$

$$\frac{dz}{\sqrt{z}} = \frac{du}{\sqrt{a}}$$

$$z^{-1/2} dz = \frac{du}{\sqrt{a}}$$

Integrating, we get.

$$\frac{z^{1/2}}{1/2} = \frac{u}{\sqrt{a}} + b$$

$$2\sqrt{z} = \frac{x+iy}{\sqrt{a}} + b \quad \text{--- ②}$$

(i) To find the singular integral

Diff ② partially w.r to  $b$ , we get.

$$0 = 1 \text{ (which is absurd)}$$

There is no singular integral.

(ii) To find the general integral

Put  $b = f(a)$  in ②, we get

$$2\sqrt{z} = \frac{x+iy}{\sqrt{a}} + f(a) \quad \text{--- ③}$$

$$\frac{\partial z}{\partial a} = 0 \quad \text{--- ④}$$

Eliminate  $a$  betw ③ and ④ we get the general integral



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2. Solve  $z^2 = 1 + p^2 + q^2$

Sol

$$\text{Gn } z^2 = 1 + p^2 + q^2 \text{ --- (1)}$$

This is of the type  $f(z, p, q) = 0$

(i) To find the complete integral

Let  $u = x + ay$

$$p = \frac{dz}{du} \quad q = a \frac{dz}{du}$$

Substituting the values of  $p$  and  $q$  in (1), we get.

$$z^2 = 1 + \left(\frac{dz}{du}\right)^2 + \left(a \frac{dz}{du}\right)^2$$

$$z^2 = 1 + \left(\frac{dz}{du}\right)^2 + a^2 \left(\frac{dz}{du}\right)^2$$

$$z^2 - 1 = \left(\frac{dz}{du}\right)^2 (1 + a^2)$$

$$\left(\frac{dz}{du}\right)^2 = \frac{z^2 - 1}{1 + a^2}$$

$$\frac{dz}{du} = \frac{\sqrt{z^2 - 1}}{\sqrt{1 + a^2}}$$

$$\frac{dz}{\sqrt{z^2 - 1}} = \frac{du}{\sqrt{1 + a^2}}$$

Integrating, we get .

$$\cosh^{-1} z = \frac{u}{\sqrt{1 + a^2}} + b$$

$$\cosh^{-1} z = \frac{x + ay}{\sqrt{1 + a^2}} + b \text{ --- (2)}$$

which is the required complete integral

Diff (2) partially w.r to  $b$ , we get

$0 = 1$  (absurd) hence (2) add a constant

There is no singular integral





(ii) To find the general integral

put  $b = f(a)$  in ②

$$\cosh^{-1} z = \frac{x+ay}{\sqrt{1+a^2}} + f(a) \quad \text{--- ③}$$

$$\frac{\partial z}{\partial a} = 0. \quad \text{--- ④}$$

Eliminate  $a$  betw ③ and ④, we get the general integral

Lagrange's linear PDE.

1. Solve  $xp + yq = z$ .

Soln

Given  $xp + yq = z$ .

The given PDE is a Lagrange's linear equation with

$$P = x, Q = y, R = z.$$

The subsidiary equations are  $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ .

$$\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$$

Taking the 1<sup>st</sup> two ratios, we get

$$\frac{dx}{x} = \frac{dy}{y}$$

Integrating we get:

$$\log x = \log y + \log c,$$

$$\log x - \log y = \log c,$$

$$\log \left( \frac{x}{y} \right) = \log c,$$

$$\frac{x}{y} = c,$$

$$u = \frac{x}{y}$$



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(ii) To find the general integral

put  $b = f(a)$  in ②

$$\cosh^{-1} z = \frac{x + ay}{\sqrt{1+a^2}} + f(a) \quad \text{--- ③}$$

$$\frac{\partial z}{\partial a} = 0. \quad \text{--- ④}$$

Eliminate  $a$  b/w ③ and ④, we get the general integral