



DEPARTMENT OF MATHEMATICS

UNIT-I PARTIAL DIFFERENTIAL EQUATIONS

Type 1

It is of the form $f(p, q) = 0$.
Complete Integral
Here the solution is $z = ax + by + c$

(1) solve: $p^2 + q^2 = 4$

Here solution is $z = ax + by + c$.

$$f(p, q) = p^2 + q^2 - 4 = 0$$

$$\Rightarrow f(a, b) = a^2 + b^2 - 4 = 0$$

$$\Rightarrow a^2 + b^2 = 4$$

$$\Rightarrow b^2 = 4 - a^2$$

$$b = \pm \sqrt{4 - a^2}$$

\therefore Complete soln. is $z = ax \pm (\sqrt{4 - a^2})y + c$.

(2) solve: $\sqrt{p} + \sqrt{q} = 1$

soln. is $z = ax + by + c$.

$$f(p, q) = \sqrt{p} + \sqrt{q} - 1 = 0$$

$$f(a, b) = \sqrt{a} + \sqrt{b} - 1 = 0$$

$$\Rightarrow \sqrt{a} + \sqrt{b} = 1$$

$$\Rightarrow b = (1 - \sqrt{a})^2$$

$$z = ax + (\sqrt{1 - \sqrt{a}})^2 y + c$$



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$$\textcircled{3} \quad p+q+pq=0$$

$$f(p, q) = p+q+pq=0$$

$$f(a, b) = a+b+ab=0$$

$$\Rightarrow a+b+ab=0$$

$$\Rightarrow a(1+b)+b=0$$

$$\Rightarrow b = -a(1+b)$$

$$\Rightarrow a = -\frac{b}{1+b}$$

$$\therefore z = -\frac{b}{1+b}x + by + c$$

$$\textcircled{5} \quad p=q^2$$

$$f(p, q) = p-q^2=0$$

$$f(a, b) = a-b^2=0$$

$$\Rightarrow a = b^2$$

$$\therefore z = b^2x + by + c$$