SEM-2 (MATHEMATICS GENERAL)
(ANUP RAY)

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Ex: Solve $y = p\tan p + \log\cos p$

Ans: We have $y = p\tan p + \log\cos p$ ---- (1)
Differentiating (1) with respect to $x$ and writing $p$ for $dy/dx$ we get,

$$p = [\tan p + p\sec^2 p + \frac{1}{\cos p}(-\sin p)]\frac{dp}{dx}$$

or $dx = \sec^2 p\, dp$ ---- (2)

Integrating (2) we get

$x = \tan p + c$ ---- (3), $c$ being an arbitrary constant

(1) & (3) gives the solution in parametric form, $p$ being the parameter.

Ex: Solve $p^3 + p = e^y$

Ans: We have $p^3 + p = e^y$
Taking logarithm of both sides of the given equation we get

$$y = \log\{p(1+p^2)\} = \log p + \log(1+p^2) \text{ ---- (1)}$$

Differentiating (1) w.r.t. $x$ we have

$$p = \left(\frac{1}{p} + \frac{2p}{1+p^2}\right)\frac{dp}{dx}$$

or $dx = \left(\frac{1}{p^2} + \frac{2}{1+p^2}\right)dp$

Integrating we get

$x = -\frac{1}{p} + 2\tan^{-1} p + c$ ---- (2),
$c$ being an arbitrary constant.

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(1) & (2) together give the required solution in parametric form, $p$ being the parameter.

Solve the following equations:

1) $y = \sin p - p\cos p$ 2) $e^{p-y} = p^2 - 1$

3) $y = a\sqrt{1+p^2}$ 4) $y = 2p + 3p^2$

5) $p - y = \log(p^2 - 1)$ 6) $y = 2p + \sqrt{1+p^2}$

(f) Equations not containing $y$

If the given equation does not contain $y$, and let it be put in the form

$$f(x, p) = 0, \quad p = \frac{dy}{dx} \quad \text{---} (1)$$

Then the equation is either solvable for $p$ or it is solvable for $x$. Hence using the methods as in the previous class, the complete primitive is determined.

Solve the following equations:

7) $p^2 - 2xp + 1 = 0$ 8) $4xp^2 = (3x - a)^2$

9) $x(1+p^2) = 1$ 10) $x + (p/\sqrt{1+p^2}) = a$