SEM-2 (MATHEMATICS GENERAL)
(ANUP RAY)

Ex: Solve $y = 2px - p^2$

Ans: Differentiating the given equation both sides w.r.t. x we have

$$p = 2p + 2x\frac{dp}{dx} - 2p\frac{dp}{dx}$$

or $p + 2(x-p)\frac{dp}{dx} = 0$ or $p\frac{dx}{dp} + 2(x-p) = 0$

or $\frac{dx}{dp} + \frac{2}{p}x = 2$, which is a linear Eqn.

$$\text{I.F.} = e^{\int \frac{2}{p}dp} = e^{2\log p} = p^2$$

$$\therefore p^2\frac{dx}{dp} + 2xp = 2p^2$$

or $\frac{d}{dp}(xp^2) = 2p^2$

Integrating $xp^2 = \frac{2}{3}p^3 + c$

or $x = \frac{2}{3}p + cp^{-2}$ ...(1)

Putting this value of x in the given equation we get

$$y = 2p\left[\frac{2}{3}p + cp^{-2}\right] - p^2$$

or $y = \frac{1}{3}p^2 + 2cp^{-1}$ ... (2)

(1) & (2) together give the general solution of the given equation

Answer of Home works Problems (08/06/2020):

1) $4c^2x^2 - 8cy - 1 = 0$ 2) $xy + c = c^2x$

3) $x = \frac{a}{2}\left[\log\{c(p-1)/\sqrt{1+p^2}\} - \tan^{-1}p\right]$

$y = \frac{a}{2}\left[\log\{c(p-1)/\sqrt{1+p^2}\} + \tan^{-1}p\right]$

4) solved above

5) $x = -\frac{8}{5}p + cp^{-3/2}$, $y = 3cp^{-\frac{1}{2}} - \frac{4}{5}p^2$

6) $x^2 + y^2 - 2cx = 0$

Answers of Home work Problems (15/06/2020):

	GS	SS
1)	$y = cx - e^c$	$y = x\log x - x$
2)	$y = cx + a/c$	$y^2 = 4ax$
3)	$y = cx + ac(1-c)$	$(x+a)^2 = 4ay$
4)	$cy = c^2(x-b) + a$	$y^2 = 4a(x-b)$
5)	$y = cx + c^n$	$n^n y^{n-1} + x^n (n-1)^{n-1} = 0$
6)	$y = cx + \sqrt{a^2c^2+b^2}$	$x^2/a^2 + y^2/b^2 = 1$
7)	$(x-a)c^2 + (x-y)c - y = 0$	$(x+y)^2 = 4ay$
8)	$(y+1)c - c^2x + 2 = 0$	$(y+1)^2 + 8x = 0$
9)	$y = cx + \cos^{-1}c$	$y = \pm\sqrt{x^2-1} + \cos^{-1}(\sqrt{x^2-1}/x)$

e) Equations not containing x

If the given equation does not contain x and let it be put in the form $f(y, p) = 0$ ...(1)
Then equation (1) is either solvable for p or it is solvable for y.

Hence using methods as described before, the complete primitive is determined.