CAREER POINT

MOCK TEST PAPER

RAJSTHAN BOARD OF SENIOR SECONDARY EXAMINATION

MATHEMATICS

गणित

SOLUTION

Sol.1 $\tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$

$\sec^{-1}(-2) = \frac{2\pi}{3}$

So, $\tan^{-1}(\sqrt{3}) - \sec^{-1}(-2) = \frac{\pi}{3} - \frac{2\pi}{3} = \frac{-\pi}{3}$

Sol.2 $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

$\begin{bmatrix} 2x+3 & 10-4 \\ 14+1 & 2y-6+2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$

From concept of equal matrix. We can write.

(समान मैट्रिक्स की अवधारणा से)

$2x + 3 = 7 \Rightarrow x = 2$

$2y - 4 = 14 \Rightarrow y = 9$

So, $x + y = 11$

Sol.3 $|A| = 4$

$|\lambda A| = \lambda^n |A| \ \forall\ n$ = order of matrix (मैट्रिक्स की कोटि)

So, $|2A| = 2^3 |A| = 8|A|$

$= 32 \quad \forall\ |A| = 4$

Sol.4 $I = \int e^x(\sec x + \sec x \tan x)\,dx$

By the property [गुणधर्म से]

$\int e^x(f(x) + f'(x))dx = e^x f(x) + c$

So, $I = e^x \sec x + c$

So, $\boxed{f(x) = \sec x}$

Sol.5 $(\hat{i} \times \hat{j}) \cdot \hat{k} + \hat{i} \cdot \hat{j}$

$= \hat{k} \cdot \hat{k} + 0 = |\hat{k}|^2 = 1$

Sol.6 Distance [दूरी] $= \frac{|0-0+0-3|}{\sqrt{9+16+144}} = \frac{3}{13}$

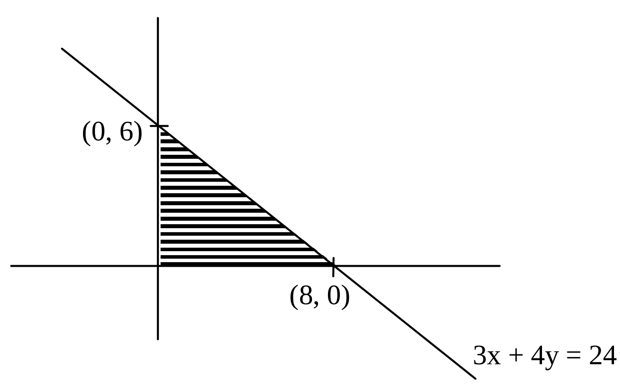
Sol.7 $I = \int (1-x)\sqrt{x}\,dx = \int (\sqrt{x} - x^{3/2})dx$

$= \frac{2}{3}x^{3/2} - \frac{2}{5}x^{5/2} + C$

Sol.8 $\vec{a} \times \vec{b} = (2\hat{i} + \hat{j} + 3\hat{k}) \times (3\hat{i} + 5\hat{j} - 2\hat{k})$

$= \begin{vmatrix} i & j & k \\ 2 & 1 & 3 \\ 3 & 5 & -2 \end{vmatrix} = -17\hat{i} + 13\hat{j} + 7\hat{k}$

Sol.9



Sol.10 P(Both cards are black) [दोनों पत्ते काले होने की प्रायिकता] $= \frac{{}^{26}C_2}{{}^{52}C_2} = \frac{25}{102}$

Sol.11 $x = \sqrt{a^{\sin^{-1}(t)}}$ $\quad y = \sqrt{a^{\cos^{-1}(t)}}$

$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt}$$

$$= \frac{\frac{1}{2\sqrt{a^{\cos^{-1}(t)}}} \times a^{\cos^{-1}(t)} \log_e a \times \frac{-1}{\sqrt{1-t^2}}}{\frac{1}{2\sqrt{a^{\sin^{-1}(t)}}} \times a^{\sin^{-1}(t)} \log_e a \times \frac{1}{\sqrt{1-t^2}}}$$

$$\frac{dy}{dx} = -\frac{\sqrt{a^{\cos^{-1}(t)}}}{\sqrt{a^{\sin^{-1}(t)}}} = -\frac{y}{x}$$

Alternate (वैकल्पिक हल):

$x^2y^2 = a^{\pi/2}$

$xy = a^{\pi/4}$

$x\frac{dy}{dx} + y = 0$

$\Rightarrow \quad \frac{dy}{dx} = -\frac{y}{x}$

OR (अथवा)

$$y = \tan^{-1}\left[\frac{\sqrt{1+x^2}-1}{x}\right]$$

Put $x = \tan\theta$

$$y = \tan^{-1}\left[\frac{\sec\theta - 1}{\tan\theta}\right] = \tan^{-1}\left[\frac{1-\cos\theta}{\sin\theta}\right]$$

$$y = \tan^{-1}\left[\frac{2\sin^2\theta/2}{2\sin\theta/2\cos\theta/2}\right] = \tan^{-1}[\tan\theta/2]$$

$$y = \frac{\theta}{2} = \frac{1}{2}\tan^{-1}(x)$$

$$\frac{dy}{dx} = \frac{1}{2}\left(\frac{1}{1+x^2}\right)$$

Sol.12 $\int_{-1}^{2} |x^3 - x|\,dx$

$$\int_{-1}^{2} |x(x-1)(x+1)|\,dx$$

$$\int_{-1}^{0}(x^3-x)dx + \int_{0}^{1}(x-x^3)dx + \int_{1}^{2}(x^3-x)dx$$

$$\left[\frac{x^4}{4}-\frac{x^2}{2}\right]_{-1}^{0} + \left[\frac{x^2}{2}-\frac{x^4}{4}\right]_{0}^{1} + \left[\frac{x^4}{4}-\frac{x^2}{2}\right]_{1}^{2}$$

$$\left\{(0-0)-\left(\frac{1}{4}-\frac{1}{2}\right)\right\} +$$

$$\left\{\left(\frac{1}{2}-\frac{1}{4}\right)-(0-0)\right\} + \left\{\left(\frac{16}{4}-\frac{4}{2}\right)-\left(\frac{1}{4}-\frac{1}{2}\right)\right\}$$

$$= \left\{\frac{1}{4}\right\} + \left\{\frac{1}{4}\right\} + \left\{2+\frac{1}{4}\right\}$$

$$= \frac{3}{4} + 2 = \frac{11}{4}$$

OR (अथवा)

$$I = \int_0^{\pi} \frac{x\sin x}{1+\cos^2 x}dx \qquad \text{....(1)}$$

$$I = \int_0^{\pi} \frac{(\pi - x)\sin x}{1+\cos^2 x}dx \qquad \text{...(2)}$$

add equation (1) and (2)

$$2I = \int_0^{\pi} \frac{\pi \sin x}{1+\cos^2 x}dx$$

Put, $\cos x = t \Rightarrow -\sin x\,dx = dt$

$$2I = -\int_{1}^{-1} \frac{\pi dt}{1+t^2}$$

$$2I = \pi\int_{-1}^{1} \frac{dt}{1+t^2}$$

$$2I = \pi[\tan^{-1}(t)]_{-1}^{1}$$

$$2I = \pi \times \frac{\pi}{2}$$

$$I = \frac{\pi^2}{4}$$

Sol.13

$$F(x).F(y) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos y & -\sin y & 0 \\ \sin y & \cos y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos x \cos y - \sin x \sin y & -\cos x \sin y - \sin x \cos y & 0 \\ \sin x \cos y + \cos x \sin y & \cos x \cos y - \sin x \sin y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos(x+y) & -\sin(x+y) & 0 \\ \sin(x+y) & \cos(x+y) & 0 \\ 0 & 0 & 1 \end{bmatrix} = F(x+y)$$

OR (अथवा)

A = IA

$$\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$$

$R_2 \to R_2 - 2R_1$

$$\begin{bmatrix} 2 & 0 & -1 \\ 1 & 1 & 2 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$R_1 \to R_2 - R_1$

$$\begin{bmatrix} 1 & -1 & -3 \\ 1 & 1 & 2 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 3 & -1 & 0 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$R_1 \to R_1 + R_3$

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 2 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 3 & -1 & 1 \\ -2 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$$

$R_2 \to R_2 - R_1$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 3 & -1 & 1 \\ -5 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix} A$$

$R_3 \to R_3 - R_2$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & -1 & 1 \\ -5 & 2 & -1 \\ 5 & -2 & 2 \end{bmatrix} A$$

$R_2 \to R_2 - 2R_3$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ -5 & 2 & -2 \end{bmatrix} A$$

$I = A^{-1}A$ So, $A^{-1} = \begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ -5 & 2 & -2 \end{bmatrix}$

Sol.14 $(1 + x^2)\dfrac{dy}{dx} + 2xy = \cot x$

$$\frac{dy}{dx} + \frac{2x}{1+x^2} \cdot y = \frac{\cot x}{1+x^2}$$

Linear differential equation form

(रैखिक अवकल समीकरण रूप)

$$P = \frac{2x}{1+x^2}$$

$$\therefore \int P dx = \int \frac{2x}{1+x^2} dx = \log(1+x^2)$$

Integrating factor (समाकलन गुणांक)

$$= e^{\int P dx} = (1+x^2)$$

So solution of differential equation

(इसलिए अवकल समीकरण का हल)

$$y \cdot (1+x^2) = \int \frac{(\cot x)}{1+x^2}(1+x^2)dx$$

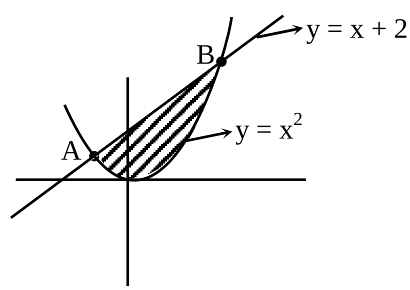
$$y \cdot (1+x^2) = \int \cot x \, dx$$

$$\boxed{y \cdot (1+x^2) = \log(\sin x) + C}$$

Where C $\to$ constant of integration

(जहाँ C $\to$ समाकलन का स्थिरांक है)

Sol.15



For A & B (A तथा B के लिए)

$x^2 = x + 2$

$\Rightarrow x^2 - x - 2 = 0$

$\Rightarrow (x + 1)(x - 2) = 0$

$\Rightarrow x = -1, 2$

So A $\equiv$ (–1, 1) and B $\equiv$ (2, 4)

So Required Area (अतः अभीष्ट क्षेत्रफल)

$$= \int_{-1}^{2}(x+2-x^2)\,dx$$

$$= \left[\frac{x^2}{2}+2x-\frac{x^3}{3}\right]_{-1}^{2} = \left[2+4-\frac{8}{3}-\frac{1}{2}+2-\frac{1}{3}\right]$$

$$= \frac{9}{2} \text{ sq. units (वर्ग इकाई)}$$

Sol.16 $P(A) = 0.3$

$P(B) = 0.6$

$P(A \cap B) = P(A).P(B)$

$= 0.18$

(i) $P(A \text{ and } B) = P(A \cap B) = 0.18$

(ii) $P(A \cap \overline{B}) = P(A) - P(A \cap B)$

$= 0.3 - 0.18$

$= 0.12$

Sol.17 $f(x) = \begin{cases} kx+1, & \text{if } x \le 5 \\ 3x-5, & \text{if } x > 5 \end{cases}$

$f(5) = 5k + 1$

$f(5^+) = 3(5 + h) - 5$

$= 10 + 3h$

$= 10 \ \forall\ h \to 0$

$f(5^-) = k(5 - h) + 1$

$= 5k + 1 - kh \ \forall\ h \to 0$

$= 5k + 1$

$\because$ Function is continuous (फलन सतत् है)

$f(5) = f(5^+) = f(5^-)$

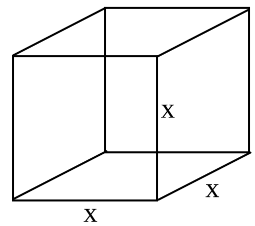
$10 = 5k + 1$

$k = 9/5$

Sol.18 $\displaystyle\int \frac{dx}{\sqrt{7-6x-x^2}} = \int \frac{dx}{\sqrt{16-(x+3)^2}}$

$= \sin^{-1}\left(\frac{x+3}{4}\right) + C$

Sol.19



Let the edge of cube = x.
(माना घन की कोर = x)

$\frac{dx}{dt} = 3\frac{cm}{sec.}$

Volume (आयतन) = V

$V = x^3$.

$\frac{dV}{dt} = 3x^2 . \frac{dx}{dt}$

$= 3(10)^2 . 3$

$= 900 \frac{cm^3}{sec.}$

Sol.20 $y^2 = 4ax$

$\frac{dy}{dx} = \frac{2a}{y}$

at $(at^2, 2at)$

$m_{tangent} = \frac{1}{t}$

Hence equation of tangent

(अतः स्पर्श रेखा का समीकरण)

$y - 2at = \frac{1}{t}(x - at^2)$

$ty - 2at^2 = x - at^2$

$ty = x + at^2$

also $m_{normal} = -t$

Hence equation of normal

(अतः अभिलम्ब का समीकरण)

$y - 2at = -t(x - at^2)$

$y = -tx + 2at + at^3$

Sol.21 $I = \displaystyle\int_{0}^{\pi/2} \frac{\sin x}{1+\cos^2 x}dx$

Let $\cos x = t$, $\sin x\, dx = -dt$

at $x = 0$, $t = 1$

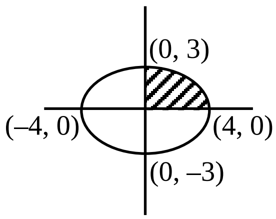
at x = π/2, t = 0

$$I = -\int_1^0 \frac{dt}{1+t^2} = \int_0^1 \frac{dt}{1+t^2} = [\tan^{-1} t]_0^1$$

$= \tan^{-1}1 - \tan^{-1} 0$

$= \frac{\pi}{4} - 0 = \frac{\pi}{4}$

Sol.22



$$\frac{x^2}{16} + \frac{y^2}{9} = 1 \quad \Rightarrow \quad y^2 = 9\left(1 - \frac{x^2}{16}\right)$$

Required Area (अभीष्ट क्षेत्रफल)

$$= 4\int_0^4 3\sqrt{1 - \frac{x^2}{16}}\,dx$$

$$= 3\int_0^4 \sqrt{16 - x^2}\,dx = 3\left[\frac{x}{2}\sqrt{16 - x^2} + 8\sin^{-1}\frac{x}{4}\right]_0^4$$

$= 3\left[8 \times \frac{\pi}{2} - 0\right]$ = 12π sq. units (वर्ग इकाई)

Sol.23 $Z_{min.} = 3x + 5y$

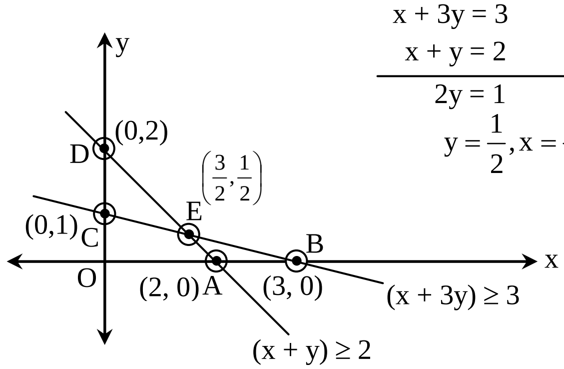
$x + 3y \geq 3$

$x + y \geq 2$

where $x \geq 0, y \geq 0$

$x + 3y = 3$
$x + y = 2$
———
$2y = 1$

$y = \frac{1}{2}, x = \frac{3}{2}$



सुसंगत क्षेत्र अपरिबद्ध (unbounded) है।

Angular Points **(कोणीय बिन्दु)**	**Z = 3x + 5y**
B(3, 0)	9
$E\left(\frac{3}{2}, \frac{1}{2}\right)$	7 → न्यूनतम
D(0, 2)	10

OR (अथवा)

let first class ticket = x

(मानलो प्रथम श्रेणी के टिकट = x)

Economy class ticket = y

(सस्ते श्रेणी के टिकट = y)

Maximum passengers = 200

(अधिकतम यात्री = 200)

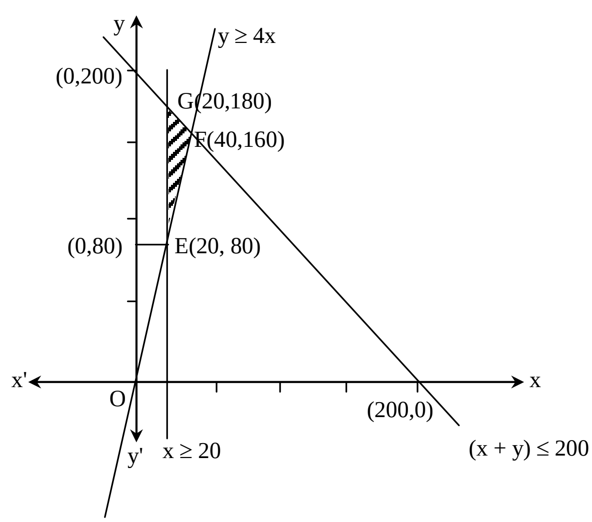
अत: $x + y \leq 200$

$Z = 400x + 600y$

$x + y \leq 200$ …(1)

$x \geq 20$ …(2)

$y \geq 4x$ …(3)



Feasible region is bounded then angular point will be.

(सुसंगत क्षेत्र परिबद्ध है कोणीय बिन्दु होंगे।)

Angular Points **(कोणीय बिन्दु)**	**Z = 400 x + 600 y**
E(20, 80)	Z = 56,000
F(40, 160)	Z = 1, 12,000
G(20, 180)	Z = 1,16,000 → अधिकतम

Maximum profit (अधिकतम लाभ) = 1,16,000/-

Sol.24 P(4 Heads (चित) 6 Tails (पट))

$$= {}^{10}C_4 \left(\frac{1}{2}\right)^4 \cdot \left(\frac{1}{2}\right)^6$$

$$= \frac{210}{2^{10}} = \frac{105}{512}$$

Sol.25 $\vec{a} + \lambda\vec{b} \perp \vec{c}$

$(\vec{a} + \lambda\vec{b}) \cdot (\vec{c}) = 0$

$\vec{a}.\vec{c} + \lambda\,\vec{b}.\vec{c} = 0$

$(2\hat{i} + 2\hat{j} + 3\hat{k}) \cdot (3\hat{i} + \hat{j}) + \lambda(-\hat{i} + 2\hat{j} + \hat{k}) \cdot (3\hat{i} + \hat{j}) = 0$

$(6 + 2) + \lambda(-3 + 2) = 0$

$\lambda = 8$

Sol.26 $\begin{vmatrix} x & x^2 & 1+px^3 \\ y & y^2 & 1+py^3 \\ z & z^2 & 1+pz^3 \end{vmatrix}$

$$= \begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} + \begin{vmatrix} x & x^2 & px^3 \\ y & y^2 & py^3 \\ z & z^2 & pz^3 \end{vmatrix}$$

$$= \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} + pxyz \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$$

$$= (1 + pxyz) \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$$

$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$

$$= (1 + pxyz) \begin{vmatrix} 1 & x & x^2 \\ 0 & y-x & y^2-x^2 \\ 0 & z-x & z^2-x^2 \end{vmatrix}$$

$$= (1 + pxyz)\,(y - x)\,(z - x) \begin{vmatrix} 1 & x & x^2 \\ 0 & 1 & y+x \\ 0 & 1 & z+x \end{vmatrix}$$

$= (1 + pxyz)\,(y - x)\,(z - x)\,(z + x - y - x)$

$= (1 + pxyz)\,(x - y)\,(y - z)\,(z - x)$

OR

$3x - 2y + 3z = 8$

$2x + y - z = 1$

$4x - 3y + 2z = 4$

$AX = B$

$$\forall\ A = \begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix},\ X = \begin{bmatrix} x \\ y \\ z \end{bmatrix},\ B = \begin{bmatrix} 8 \\ 1 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} 3 & -2 & 3 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix} X = \begin{bmatrix} 8 \\ 1 \\ 4 \end{bmatrix}$$

$R_1 \to R_1 - R_2$

$$\begin{bmatrix} 1 & -3 & 4 \\ 2 & 1 & -1 \\ 4 & -3 & 2 \end{bmatrix} X = \begin{bmatrix} 7 \\ 1 \\ 4 \end{bmatrix}$$

$R_2 \to R_2 - 2R_1$

$$\begin{bmatrix} 1 & -3 & 4 \\ 0 & 7 & -9 \\ 4 & -3 & 2 \end{bmatrix} X = \begin{bmatrix} 7 \\ -13 \\ 4 \end{bmatrix}$$

$R_3 \to R_3 - 4R_1$

$$\begin{bmatrix} 1 & -3 & 4 \\ 0 & 7 & -9 \\ 0 & 9 & -14 \end{bmatrix} X = \begin{bmatrix} 7 \\ -13 \\ -24 \end{bmatrix}$$

$R_1 \to 3R_1 + R_3$

$$\begin{bmatrix} 3 & 0 & -2 \\ 0 & 7 & -9 \\ 0 & 9 & -14 \end{bmatrix} X = \begin{bmatrix} -3 \\ -13 \\ -24 \end{bmatrix}$$

$R_3 \to R_3 - R_2$

$$\begin{bmatrix} 3 & 0 & -2 \\ 0 & 7 & -9 \\ 0 & 2 & -5 \end{bmatrix} X = \begin{bmatrix} -3 \\ -13 \\ -11 \end{bmatrix}$$

$R_2 \to R_2 - 3R_3$

$$\begin{bmatrix} 3 & 0 & -2 \\ 0 & 1 & 6 \\ 0 & 2 & -5 \end{bmatrix} X = \begin{bmatrix} -3 \\ 20 \\ -11 \end{bmatrix}$$

$R_3 \to R_3 - 2R_2$

$$\begin{bmatrix} 3 & 0 & -2 \\ 0 & 1 & 6 \\ 0 & 0 & -17 \end{bmatrix} X = \begin{bmatrix} -3 \\ 20 \\ -51 \end{bmatrix}$$

$$\begin{bmatrix} 3 & 0 & -2 \\ 0 & 1 & 6 \\ 0 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} -3 \\ 20 \\ 3 \end{bmatrix}$$

$R_1 \to R_1 + 2R_3$

$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 1 & 6 \\ 0 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} 3 \\ 20 \\ 3 \end{bmatrix}$$

$R_2 \to R_2 - 6R_3$

$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} 3 \\ 2 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} X = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

$x = 1, \quad y = 2, \quad z = 3$

Sol.27 $I = \int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$

Let $x = \sin\theta$

$dx = \cos\theta\, d\theta$

$I = \int \frac{\sin\theta \cdot \theta \cdot \cos\theta d\theta}{\sqrt{1-\sin^2\theta}} = \int \theta \sin\theta d\theta$

$= -\theta\cos\theta + \int \cos\theta\, d\theta$

$= -\theta\cos\theta + \sin\theta + C$

$= -\sqrt{1-x^2}\sin^{-1}x + x + C$

Sol.28 $P_1 : 3x - y + 2z - 4 = 0$

$P_2 : x + y + z - 2 = 0$

Equation of plane passing through intersection of plane P_1 and plane P_2

(समतल P_1 तथा P_2 के प्रतिच्छेदन से होकर गुजरने वाले समतल का समीकरण)

$P_1 + \lambda P_2 = 0$

$(3 + \lambda)x + (\lambda - 1)y + (\lambda + 2)z - 4 - 2\lambda = 0$

$\because$ the point (2, 2, 1) lies on the required plane.

($\because$ बिन्दु (2, 2, 1) अभीष्ट समतल पर स्थित है)

So, $2(3 + \lambda) + 2(\lambda - 1) + (\lambda + 2) - 4 - 2\lambda = 0$

$\lambda = \frac{-2}{3}$

So, required equation of plane (अतः समतल का अभीष्ट समीकरण)

$\frac{7}{3}x - \frac{5}{3}y + \frac{4}{3}z - 4 + \frac{4}{3} = 0$

$7x - 5y + 4z - 8 = 0$

Sol.29 $x\frac{dy}{dx} - y + x\sin\frac{y}{x} = 0$

$\Rightarrow \frac{dy}{dx} - \frac{y}{x} + \sin\frac{y}{x} = 0$

Put $y = vx$

$\frac{dy}{dx} = v + x\frac{dv}{dx}$

$v + x\frac{dv}{dx} - v + \sin v = 0$

$\Rightarrow x\frac{dv}{dx} = -\sin v$

$\Rightarrow \frac{dv}{\sin v} = -\frac{dx}{x}$

$\Rightarrow \int \frac{dv}{\sin v} = -\int \frac{dx}{x}$

$\Rightarrow \ell n \tan\left(\frac{\pi}{4} + \frac{v}{2}\right) = -\ell n\, x + \ell n c$

$\Rightarrow \tan\left(\frac{\pi}{4} + \frac{v}{2}\right) = \frac{c}{x}$

$\Rightarrow \frac{\pi}{4} + \frac{y}{2x} = \tan^{-1}\frac{c}{x}$

$\Rightarrow \frac{y}{2x} = \tan^{-1}\frac{c}{x} - \frac{\pi}{4}$

OR

$ydx - (x + 2y^2)dy = 0$

$\Rightarrow ydx - xdy = 2y^2dy$

$\Rightarrow \frac{ydx - xdy}{y^2} = 2dy$

$\Rightarrow d\left(\frac{x}{y}\right) = 2dy$

$\Rightarrow \int d\left(\frac{x}{y}\right) = 2\int dy$

$\Rightarrow \frac{x}{y} = 2y + c$

$\Rightarrow 2y^2 + cy - x = 0$

Sol.30 $\int_0^4 |x-1| dx = \int_0^1 (1-x)dx + \int_1^4 (x-1)dx$

$= \left[x - \frac{x^2}{2}\right]_0^1 + \left[\frac{x^2}{2} - x\right]_1^4$

$= \left[1 - \frac{1}{2} - 0\right] + \left[8 - 4 - \frac{1}{2} + 1\right] = \frac{1}{2} + \frac{9}{2} = 5$