Class-XII

Mathematics(041)

Section - A

1.Ans b.Ans 4

2.Ans a.Ans 1

3.Ans c.Ans $I - A$

4.Ans ~~a.Ans I+~~ c.Ans 1

5.Ans d.Ans 4

$$\begin{vmatrix} \alpha & 3 & 4 \\ 1 & 2 & 1 \\ 1 & 4 & 1 \end{vmatrix} = \alpha(2-4) - 3(1-1) + 4(4-2)$$

$= -2\alpha + 8 = 0$

$2\alpha = 8$

$\boxed{\alpha = 4}$

6.Ans c.Ans $2x^{2x}(1 + \log x)$

$y = x^{2x} \Rightarrow \log y = 2x \log x$ $\cancel{\frac{1}{y}\frac{dy}{dx}} = 2(\log x + x\frac{1}{x})$

$= 2x^{2x}(\log x + 1)$

7. b. $x = 1.5$

8. ~~D~~ d. $-16x$

$$x = A\cos 4t + B\sin 4t$$

$$\frac{dx}{dt} = -4A\sin 4t + 4B\cos 4t$$

$$\frac{d^2x}{dt^2} = -16A\cos 4t - 16B\sin 4t$$

$$= -16(x)$$

9. b. $(-2, -1)$

$$f'(x) = 6x^2 + 18x + 12 = 0$$

$$6(x^2 + 3x + 2) = 0$$

$$6(x+2)(x+1) = 0$$

$+$ $\quad -2 \quad$ $-$ $\quad -1 \quad$ $+$

$[-2, -1]$

$x = A\cos 4t + B\sin 4t$

$\frac{dx}{dt} = -4A$

$x^2 + 3x + 2$

$x^2 + 2x + x + 2$

$(x+2)(x+1)$

$\int \frac{\sec^2 x}{\cancel{\sec^2} 1 + \tan^2 x - \sec\tan} dx$

$\int \frac{\frac{1}{\cos x}}{\frac{1}{\cos x} - \frac{\sin x}{\cos x}}$

$\int \frac{1}{1-\sin x} \cdot \frac{1+\sin x}{1+\sin x}$

$\int \frac{1+\sin x}{\cos^2 x}$

$\int \sec^2 x + \int \sec x \tan x$

$= \tan x + \sec x + c$

10.) b.) $\sec x + \tan x + C$

11.) d.) -2

12.) b.) 3

$3\left(\frac{dy}{dx}\right)^2 \left(\frac{d^2y}{dx^2}\right)$

13.) b.) $\frac{a_1}{b_1} = \frac{a_2}{b_2} = \frac{a_3}{b_3}$

14.) c.) 7

15.) a.) $0, \frac{-1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

16.) d.) 90°

$-(x-1)$ $\quad -\frac{(x-2)}{x-2}$

$\int_{-1}^{1} -1 \, dx$

$-\int_{-1}^{1} 1 \, dx = -[x]_{-1}^{1}$

$= -[1-(-1)]$

$= -[1+1] = -2$

$\sqrt{36+4+9} = 7$

$\frac{x}{\frac{1}{2}} = \frac{y}{\frac{1}{3}} = \frac{z}{-1}$

$\frac{x}{\frac{1}{6}} = \frac{y}{-1} = \frac{z}{-4}$

$= \frac{1}{2} \cdot \frac{1}{6} - \frac{1}{3} + 4\frac{1}{4}$

$= \frac{1}{12} - \frac{1}{3} + \frac{1}{4}$

$= \frac{1 - 4 + 3\,48}{12} = 44+1$

$= \frac{45}{12}$

17.) c.) $\frac{7}{8}$

18.) c.) $\frac{31}{32}$

19.) a.) Both are true and R is correct explanation of A

20.) d.) A is false but ~~R is true.~~

20.) a.) Both A & R are and R is correct explanation of A

7

Section - B

21.) $f(x) = \tan^{-1}x$

Domain $= R$ {i.e. $(-\infty, \infty)$ }, where, $R =$ set of real numbers

Range $= \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

22.)
b.) LHL

$$\lim_{x\to 0^-} f(x) = \lim_{x\to 0^-} \frac{\sin^2 \lambda x}{x^2} = \lim_{h\to 0} \frac{\sin^2 \lambda(0-h)}{(0-h)^2}$$

$$= \lim_{h\to 0} \frac{\sin^2 \lambda h}{h^2} \times \frac{\lambda^2}{\lambda^2} = \lambda^2 \lim_{\lambda h\to 0} \left(\frac{\sin \lambda h}{\lambda h}\right)^2$$

$$= \lambda^2$$

RHL

$$\lim_{x\to 0^+} f(x) = \lim_{x\to 0^+} \frac{\sin^2 \lambda x}{x^2} = \lim_{h\to 0} \frac{\sin^2 \lambda(0+h)}{(0+h)^2}$$

$$= \lim_{h\to 0} \frac{\sin^2 \lambda h}{h^2} \times \frac{\lambda^2}{\lambda^2} = \lambda^2 \lim_{h\to 0} \left(\frac{\sin \lambda h}{\lambda h}\right)^2$$

$$= \lambda^2$$

Now,
Put $x=0$, in $f(x) = 1$

$$f(0) = 1$$

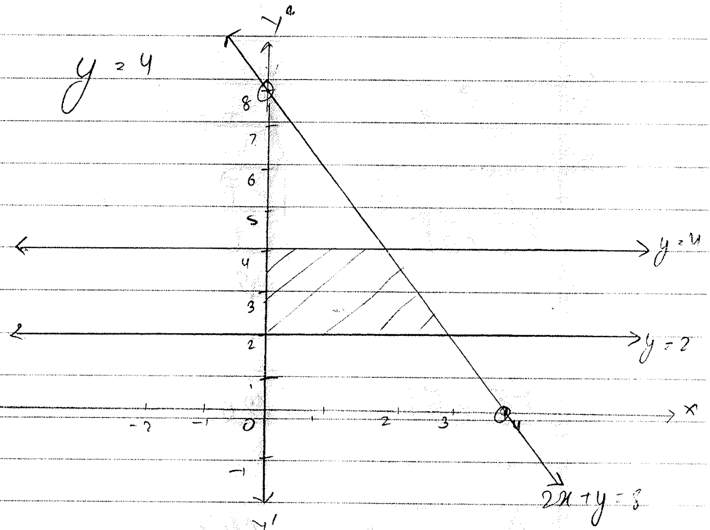
As, $f(x)$ is continuous at $x=0$

$\Rightarrow$ LHL = RHL = $f(0)$

$\Rightarrow \lambda^2 = 1$

$\Rightarrow \boxed{\lambda = \pm 1}$ ans $\lambda = \pm 1$

23.4 $\frac{2x}{8} + \frac{y}{8} = \frac{8}{8}$ $\qquad y = 2 \qquad y = 4$



$\frac{x}{4} + \frac{y}{8} = 1$

~~Point~~ of intersection

$x = \frac{1}{2}(8 - y)$

$2x + 2 = 8$

$x =$

Shaded area $= \int_2^4 \frac{1}{2}(8 - y)\,dy$

$= \frac{1}{2}\left[8y - \frac{y^2}{2}\right]_2^4 = \frac{1}{2}\left[32 - 8 - (16 - 2)\right]$

$= \frac{1}{2}\left[24 - 14\right] = 5$ sq units

ans ~~5 sq. unit~~

24. b)

$\vec{a} = \hat{i} - \hat{j} + 3\hat{k}$ $\qquad$ $\vec{b} = 2\hat{i} - 7\hat{j} + \hat{k}$

$$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -1 & 3 \\ 2 & -7 & 1 \end{vmatrix} = \hat{i}(-1+21) - \hat{j}(1-6) + \hat{k}(-7+2)$$

$$= 20\hat{i} + 5\hat{j} - 5\hat{k}$$

$$|\vec{a} \times \vec{b}| = \sqrt{(20)^2 + (5)^2 + (-5)^2} = \sqrt{400 + 25 + 25} = \sqrt{450}$$

$$= 15\sqrt{2}$$

Area of parallelogram $= |\vec{a} \times \vec{b}| = 15\sqrt{2}$ sq. units

25. A $(1, 2, -1)$

$$5x - 25 = 14 - 7y = 35z$$

$$\frac{x-5}{\left(\frac{1}{5}\right)} = \frac{y-2}{\left(\frac{-1}{7}\right)} = \frac{z}{\left(\frac{1}{35}\right)}$$

Required line is

$$\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda\left(\frac{1}{5}\hat{i} - \frac{1}{7}\hat{j} + \frac{1}{35}\hat{k}\right)$$

or $\vec{r} = (\hat{i} + 2\hat{j} - \hat{k}) + \lambda(7\hat{i} - 5\hat{j} + 1\hat{k})$

Cartesian equation:

$$\frac{x-1}{7} = \frac{y-2}{-5} = \frac{z+1}{1}$$

Section - C

26.

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

$$A^2 = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 1+6+12 & 2-4+6 & 3+2+3 \\ 3-6+4 & 6+4+2 & 9-2+1 \\ 4+6+4 & 8-4+2 & 12+2+1 \end{bmatrix}$$

$$A^2 = \begin{bmatrix} 19 & \cancel{6}\,4 & 8 \\ 1 & 12 & 8 \\ 14 & 6 & 15 \end{bmatrix}$$

$$A^3 = A^2 \times A$$

$$A^3 = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix} \begin{bmatrix} 19 & \cancel{6}\,4 & 8 \\ 1 & 12 & 8 \\ 14 & 6 & 15 \end{bmatrix} = \begin{bmatrix} 19+2+42 & 4\cancel{6}+24+18 & 8+16+45 \\ 57-2+14 & 12\cancel{8}-24+6 & 24-16+15 \\ 76+2+14 & \underset{16}{\cancel{40}}+24+6 & 32+16+15 \end{bmatrix}$$

$$\cancel{A^3 = \begin{bmatrix} 63 & 4\cancel{8}6 & 69 \\ 69 & 0 & 23 \\ 92 & 54 & 63 \end{bmatrix}} \qquad A^3 = \begin{bmatrix} 63 & 46 & 69 \\ 69 & -6 & 23 \\ 92 & 46 & 63 \end{bmatrix}$$

LHS

$$= A^3 - 23A - 40I = \begin{bmatrix} 63 & 48 & 69 \\ 69 & 0 & 23 \\ 92 & 54 & 63 \end{bmatrix} - 23\begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix} - 40\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 63 & 48 & 69 \\ 69 & 0 & 23 \\ 92 & 54 & 63 \end{bmatrix} - \begin{bmatrix} 23 & 46 & 69 \\ 69 & -46 & 23 \\ 92 & 46 & 23 \end{bmatrix}$$

LHS

$$= A^3 - 23A - 40I = \begin{bmatrix} 63 & 46 & 69 \\ 69 & -6 & 23 \\ 92 & 46 & 63 \end{bmatrix} - \begin{bmatrix} 23 & 46 & 69 \\ 69 & -46 & 23 \\ 92 & 46 & 23 \end{bmatrix} - \begin{bmatrix} 40 & 0 & 0 \\ 0 & 40 & 0 \\ 0 & 0 & 40 \end{bmatrix}$$

$$= \begin{bmatrix} 63-23-40 & 46-46 & 69-69 \\ 69-69 & -6+46-40 & 23-23 \\ 92-92 & 46-46 & 63-23-40 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$= O = RHS$$

Hence proved

~~27.4~~

~~Q.4~~

$\cancel{y = \tan x + \sec x}$

$$\frac{dy}{dx} = \sec^2 x + \sec x \cdot \tan x = \sec x(\sec x + \tan x)$$

$$\frac{d^2y}{dx^2} = \sec x \tan x \cdot (\sec x + \tan x) + \sec x(\sec x \tan x + \sec^2 x)$$

$$= \sec^2 x \tan x + \sec x \tan^2 x + \sec^2 x \tan x + \sec^3 x$$

27.4 Q.4

(i), $y = \sec^{-1}\left(\frac{1}{\sqrt{1-x^2}}\right)$

(ii), $x = \sin\theta$

$y = \sec^{-1}\left(\frac{1}{\sqrt{1-\sin^2\theta}}\right)$

$y = \sec^{-1}(\sec\theta)$

$t = \sin^{-1}(2x\sqrt{1-x^2})$

Let $x = \sin\theta$

$t = \sin^{-1}(2\sin\theta\sqrt{1-\sin^2\theta})$

$t = \sin^{-1}(\sin 2\theta)$

$y = \theta \qquad\qquad t = 2\theta$

$y = \sin^{-1}x \qquad\qquad t = 2\sin^{-1}x$

$\cancel{\dfrac{dy}{dx} = \dfrac{1}{\sqrt{1-x^2}}} \qquad\qquad \dfrac{dt}{dx} = \dfrac{2}{\sqrt{1-x^2}}$

$$\frac{dy}{dt} = \frac{dy/dx}{dt/dx} = \frac{1}{\sqrt{1-x^2}} \cdot \frac{\sqrt{1-x^2}}{2} = \frac{1}{2}$$

ans $\dfrac{1}{2}$

$\dfrac{28\,b}{a\cdot b}$

$$I = \int_0^{2\pi} \frac{1}{1+e^{\sin x}}\,dx \quad -(1)$$

$$I = \int_0^{2\pi} \frac{1}{1+e^{\sin(2\pi-x)}}\,dx \qquad \left\{\because \int_0^a f(x)\,dx = \int_0^a f(a-x)\,dx\right\}$$

$$I = \int_0^{2\pi} \frac{1}{1+e^{-\sin x}}\,dx = \int_0^{2\pi} \frac{e^{\sin x}}{1+e^{\sin x}}\,dx \quad \text{— (II)}$$

(I) + (II)

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

$$2I = [x]_0^{2\pi}$$

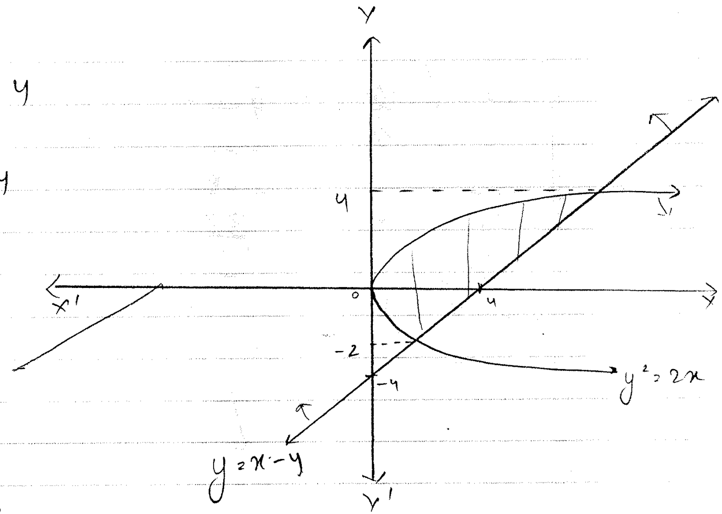
$$\cancel{2}I = \cancel{2}\pi$$

$$I = \pi$$

ans π

29. $y^2 \le 2x$ $\quad$ $y \geq x - 4$

$y^2 = 2x$ $\quad$ $y = x - 4$



$x - y = 4$

$\frac{x}{4} + \frac{y}{(-4)} = 1$

Point of intersection

$y^2 = 2x$ $\quad$ $y = x - 4$

$\Rightarrow x = y + 4$

$y^2 = 2(y+4)$

$y^2 = 2y + 8 \Rightarrow y^2 - 2y - 8 = 0$

$\Rightarrow (y-4)(y+2) = 0$

$y = -2, 4$

Required area $= \int_{-2}^{4} (y+4)\,dy - \int_{-2}^{4} \frac{y^2}{2}\,dy$

$$= \left[\frac{y^2}{2} + 4y - \frac{y^3}{6} \right]_{-2}^{4}$$

$$= \left[8 + 16 - \frac{32}{3} - \left(2 - 8 + \frac{4}{3} \right) \right]$$

$$= \left[24 - \frac{32}{3} + 6 - \frac{4}{3} \right] = \left[30 - \frac{36}{3} \right]$$

$$= \left[30 - 12 \right] = 18 \text{ sq unit}$$

ans 18 sq unit

30.(
b.) Given, $|\vec{a}| = 3$ $|\vec{b}| = 4$ $|\vec{c}| = 2$

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

squaring,

$$(\vec{a} + \vec{b} + \vec{c})^2 = 0$$

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

$$\Rightarrow \vec{a}^2 + \vec{b}^2 + \vec{c}^2 + \vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{a}\cdot\vec{c} + \vec{b}\cdot\vec{a} + \vec{c}\cdot\vec{b} + \vec{c}\cdot\vec{a} = 0$$

$$\vec{a}^2 + \vec{b}^2 + \vec{c}^2 + 2\vec{a}.\vec{b} + 2\vec{b}.\vec{c} + 2\vec{a}.\vec{c} = 0$$

$$|\vec{a}|^2 + |\vec{b}|^2 + |\vec{c}|^2 + 2(\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}) = 0$$

$$9 + 16 + 4 + 2(\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}) = 0$$

$$2\mu = -29$$

$$\mu = -\frac{29}{2} \qquad \text{ans } -\frac{29}{2}$$

31.4 Given lines are parallel lines

$$\vec{a}_1 = \hat{i} + 2\hat{j} - 4\hat{k} \qquad \vec{b} = (2\hat{i} + 3\hat{j} + 6\hat{k})$$

$$\vec{a}_2 = 3\hat{i} + 3\hat{j} - 5\hat{k}$$

$$d = \frac{|(\vec{a}_2 - \vec{a}_1) \times \vec{b}|}{|\vec{b}|}$$

$$\vec{a}_2 - \vec{a}_1 = 2\hat{i} + \hat{j} - \hat{k}$$

$$|\vec{b}| = \sqrt{4 + 9 + 36} = 7$$

$$\begin{array}{r} 196 \\ 81 \\ 16 \\ \hline 293 \end{array} \qquad 7\overline{)293}(4 \quad \begin{array}{r} 28 \\ \hline 13 \end{array}$$

distance between lines,

$$d = \frac{|(\vec{a}_2 - \vec{a}_1) \times \vec{b}|}{|\vec{b}|}$$

$$(\vec{a}_2 - \vec{a}_1) \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 1 & -1 \\ 2 & 3 & 6 \end{vmatrix}$$

$$= \hat{i}(6 + 3) - \hat{j}(12 + 2) + \hat{k}(6 - 2)$$

$$= 9\hat{i} - 14\hat{j} + 4\hat{k}$$

$$|(\vec{a}_2 - \vec{a}_1) \times \vec{b}| = \sqrt{81 + 196 + 16} = \sqrt{293}$$

$$d = \frac{\sqrt{293}}{7} \text{ unit}$$

Section -D

32)
b) Let numbers be x & y

ATQ,

$x + y = 5 \Rightarrow y = (5-x)$

then, sum of cubes,

let, $C = x^3 + y^3$

$C = x^3 + (5-x)^3$

minimise

$$\frac{dC}{dx} = 3x^2 + 3(5-x)^2(-1)$$

$$= 3x^2 - 3(5-x)^2$$

$$= 3x^2 - 3(25 + x^2 - 10x)$$

$\frac{dC}{dx} = \cancel{3x^2} - 75 - \cancel{3x^2} + 30x$

$\frac{75}{30} = \frac{15}{6} = \frac{5}{2}$

$\frac{dC}{dx} = 30x - 75$

Put $\frac{dC}{dx} = 0$

$30x - 75 = 0$

$x = \frac{75}{30} = \frac{5}{2}$

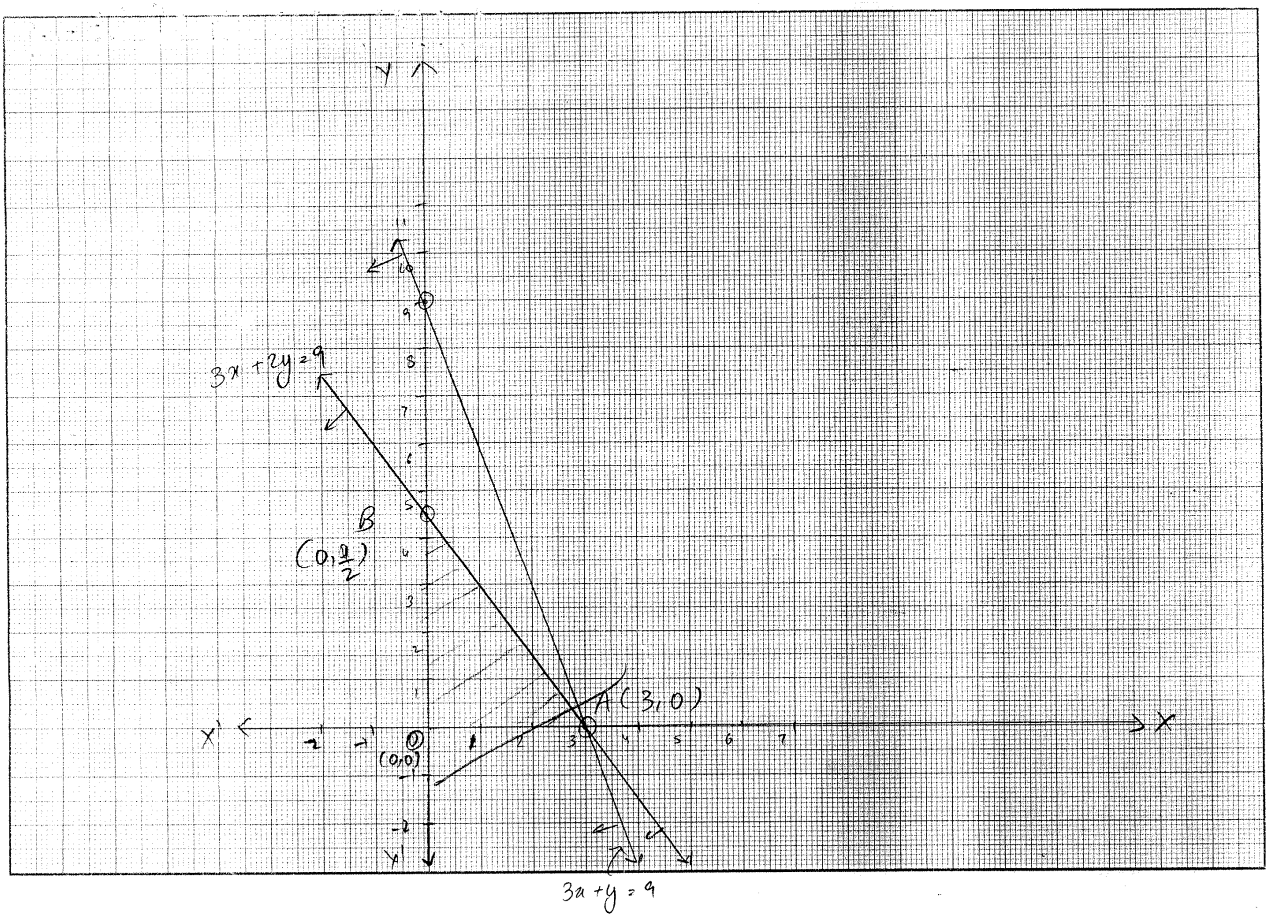
$x = \frac{5}{2}$

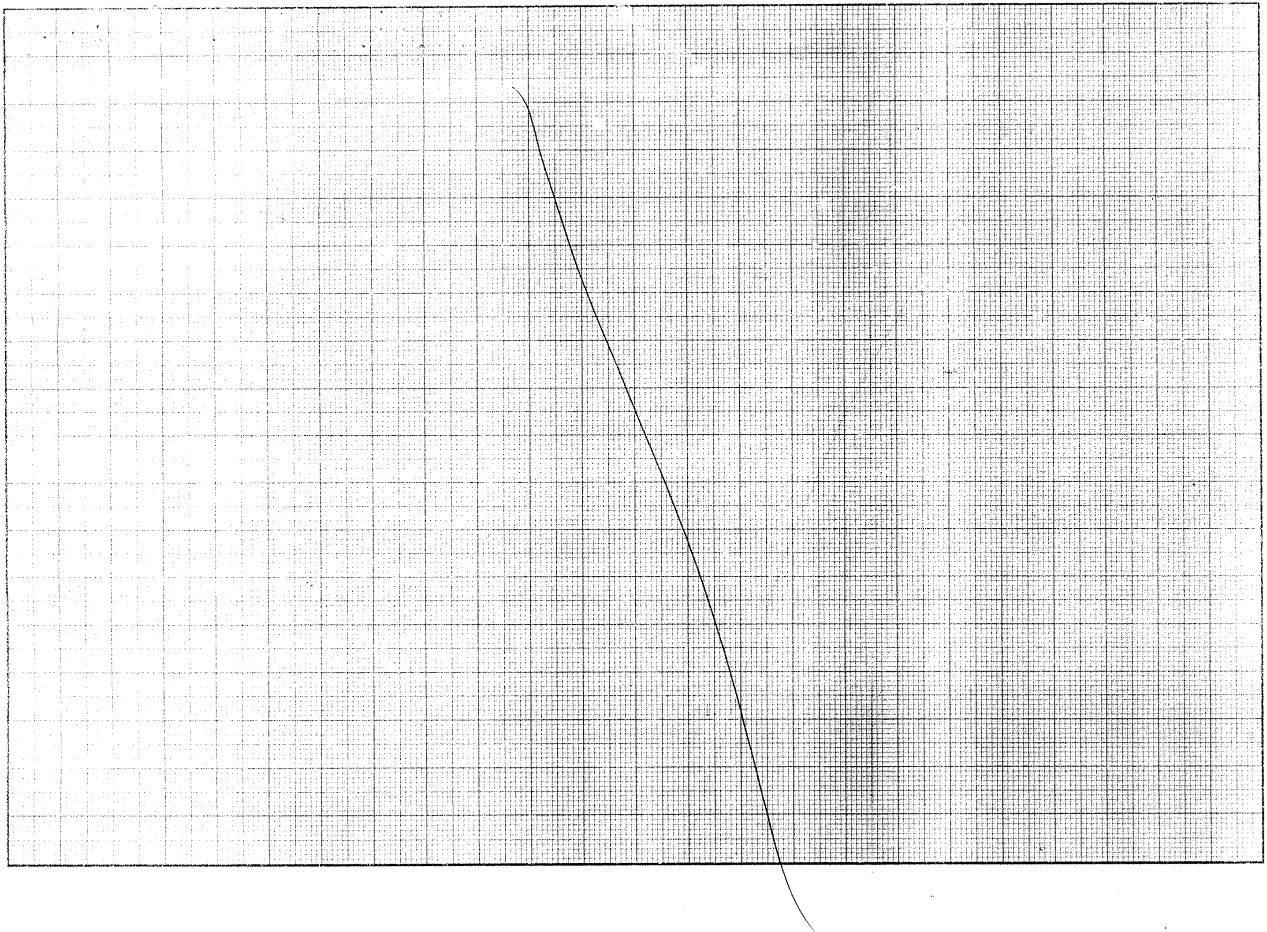
$\frac{d^2C}{dx^2} = 30$ $\therefore$ $\left.\frac{d^2C}{dx^2}\right|_{x=\frac{5}{2}} = 30 > 0$

$\therefore$ Sum of cubes is least when $x = \frac{5}{2}$ & $y = \frac{5}{2}$

$\therefore$ Sum of squares $= x^2 + y^2 = \frac{25}{4} + \frac{25}{4} = \frac{25}{2}$

ans $\frac{25}{2}$


Y
X
X'
Y'
3x + 2y = 9
3x + y = 9
B
(0, 9/2)
A (3, 0)
O
(0,0)



33.Y $I = \int_0^{\pi/2} \sin 2x \tan^{-1}(\sin x)\,dx = \int_0^{\pi/2} 2\sin x\cos x \tan^{-1}(\sin x)\,dx$

let, $\sin x = t \Rightarrow dt = \cos x\,dx$

$I = 2\int_0^1 t \tan^{-1}(t)\,dt$

let $I_1 = \int \underset{II}{t}\ \underset{I}{\tan^{-1} t}\,dt$

$I_1 = \tan^{-1} t \cdot \frac{t^2}{2} - \frac{1}{2}\int \frac{t^2+1-1}{1+t^2}\,dt = \frac{t^2}{2}\tan^{-1} t - \frac{1}{2}\int\left(1 - \frac{1}{1+t^2}\right)dt$

$I_1 = \frac{t^2}{2}\tan^{-1} t - \frac{t}{2} + \frac{1}{2}\tan^{-1} t + c.$

$I = 2\left[\frac{t^2}{2}\tan^{-1} t - \frac{t}{2} + \frac{1}{2}\tan^{-1} t\right]_0^1$

$= 2\left[\frac{1}{2}\tan^{-1}(1) - \frac{1}{2} + \frac{1}{2}\tan^{-1}(1) - \left(0 - 0 + \frac{1}{2}\tan^{-1} 0\right)\right]$

$$I = 2\left(\frac{\pi}{8} - \frac{1}{2} + \frac{\pi}{8}\right) = 2\left(\frac{\pi}{4} - \frac{1}{2}\right)$$

$$I = \frac{\pi}{2} - 1 \qquad \underline{\text{ans}} \quad \frac{\pi - 2}{2} = \cancel{\frac{1}{2}(\pi - 2)}$$

34.

$$P = 70x + 40y$$

Subject to constraints

$3x + 2y \leq 9$ $\qquad$ $3x + y \leq 9$ $\qquad$ $x \geq 0$ $\qquad$ $y \geq 0$

$3x + 2y = 9$ $\qquad$ $3x + y = 9$

$\frac{x}{3} + \frac{y}{\left(\frac{9}{2}\right)} = 1$ $\qquad$ $\frac{x}{3} + \frac{y}{9} = 1$

Corner points are $O(0,0)$, $A(3,0)$, $B\left(0, \frac{9}{2}\right)$

Put $O(0,0)$ in $P = 70(0)+40(0) = 0$
Put $A(3,0)$ in P : $P = 210$ ← Maximum
Put $B(0,\frac{9}{2})$ in P : $P = 180$

$\therefore$ Maximum value of P is 210 at $(3,0)$

35. a. Let,

E : He answered correctly

H_1 : He knows the answer

H_2 : He guesses the answer

$P(H_1) = \frac{3}{5}$ $P(H_2) = \frac{2}{5}$ $P(E|H_1) = 1$ $P(E|H_2) = \frac{1}{3}$

From Bayes Theorem

$$P(H_1|E) = \frac{P(H_1)\,P(E|H_1)}{P(H_1)\,P(E|H_1) + P(H_2)\,P(E|H_2)}$$

$$P(H_1/E) = \frac{\frac{3}{5} \times 1}{\frac{3}{5} \times 1 + \frac{2}{5} \times \frac{1}{3}} = \frac{3}{3 + \frac{2}{3}}$$

$$= \frac{3}{\frac{9+2}{3}}$$

$$P(H_1/E) = \frac{9}{11}$$

ans $\frac{9}{11}$

Section - E

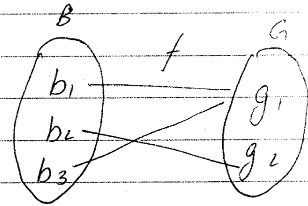
T.$\not$ Total possible relations from B to G = $2^{3 \times 2} = 2^6 = 64$

Total functions from B to G = $2^3 = 8$

III) 2nd option

$$f = \{(b_1, g_1), (b_2, g_2), (b_3, g_1)\}$$

It is not bijective as



$f(b_1) = g_1$ & $f(b_3) = g_1$

As $f(b_1) = f(b_3)$

through $b_1 \neq b_3$

∴ It is not one one as ~~for~~ b_1 & b_3 are related to same element g_1

As it is not one one, hence it is not bijective

37.) i-4. Let, cost of : 1 pen = ₹ x

1 bag = ₹ y

1 instrument box = ₹ z

then, ATQ,

$$\cancel{3x+}\ 5x + 3y + z = 160$$
$$2x + y + 3z = 190$$
$$x + 2y + 4z = 250$$

Given system of equations can be written as,

$$\underbrace{\begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x \\ y \\ z \end{bmatrix}}_{X} = \underbrace{\begin{bmatrix} 160 \\ 190 \\ 250 \end{bmatrix}}_{B}$$

$$AX = B$$

$$A = \begin{bmatrix} 5 & 3 & 1 \\ 2 & 1 & 3 \\ 1 & 2 & 4 \end{bmatrix} \qquad X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \qquad B = \begin{bmatrix} 160 \\ 190 \\ 250 \end{bmatrix}$$

ii) $|A| = 5(4-6) - 3(8-3) + 1(4-1)$

$= -10 - 15 + 3$

$|A| = -22 \neq 0 \quad \therefore A^{-1}$ exists

iii) $A_{11} = -2$ $\quad A_{12} = -5$ $\quad A_{13} = 3$

$A_{21} = -10$ $\quad A_{22} = 19$ $\quad A_{23} = -7$

$A_{31} = 8$ $\quad A_{32} = -13$ $\quad A_{33} = -1$

$$\text{adj}(A) = \begin{bmatrix} -2 & -5 & 3 \\ -10 & 19 & -7 \\ 8 & -13 & -1 \end{bmatrix}^T = \begin{bmatrix} -2 & -10 & 8 \\ -5 & 19 & -13 \\ 3 & -7 & -1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{|A|} \text{adj}(A) = -\frac{1}{22} \begin{bmatrix} -2 & -10 & 8 \\ -5 & 19 & -13 \\ 3 & -7 & -1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{22} \begin{bmatrix} 2 & 10 & -8 \\ 5 & -19 & 13 \\ -3 & 7 & 1 \end{bmatrix}$$

38.)

I.Y

$$(x^2-y^2)\,dx + 2xy\,dy = 0$$

$$2xy\,dy = -(x^2-y^2)\,dx$$

$$\frac{dy}{dx} = \frac{-(x^2-y^2)}{2xy}$$ $\div$ Numerator & Denominator by x^2

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

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

II) Let $v = \frac{y}{x} \Rightarrow y = xv$

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

$$\Rightarrow \quad v + x\frac{dv}{dx} = \frac{v^2-1}{2v}$$

$$x\frac{dv}{dx} = \frac{v^2-1}{2v} - v = \frac{v^2-1-2v^2}{2v}$$

$$x\frac{dv}{dx} = \frac{-1-v^2}{2v} = -\frac{(v^2+1)}{2v}$$

$$\frac{2v}{v^2+1}\,dv = -\frac{1}{x}\,dx$$

Integrating both sides,

$$\log|v^2+1| = -\log|x| + \log|c|$$

$$\log|v^2+1| = \log\left|\frac{c}{x}\right|$$

$$v^2 + 1 = \frac{c}{x}$$

$$\frac{y^2}{x^2} + 1 = \frac{c}{x}$$

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

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