QUESTION PAPER CODE 65/1/3

EXPECTED ANSWER/VALUE POINTS

SECTION A

1.	$A_{23} = -7$	1
2.	Required length = $\sqrt{3^2+(-4)^2}=5$ OR $\hat{n} = \frac{1}{3}(2\hat{i}-\hat{j}+2\hat{k})$ Equation of plane is $\vec{r}\cdot\hat{n}=d$ i.e. $\vec{r}\cdot\frac{1}{3}(2\hat{i}-\hat{j}+2\hat{k})=5$ or $\vec{r}\cdot(2\hat{i}-\hat{j}+2\hat{k})=15$	$\frac{1}{2}+\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
3.	ax + by = 0 differentiate wrt x, $a+b\frac{dy}{dx} = 0 \Rightarrow \frac{dy}{dx} = \frac{-a}{b}$ differenitate again, $\frac{d^2y}{dx^2}=0$, which is required equation	$\frac{1}{2}$ $\frac{1}{2}$
4.	$\sin^2 x + \cos^2 y = 1$ differentiate wrt x, $2\sin x\cdot\cos x + 2\cos y\cdot(-\sin y)\cdot\frac{dy}{dx}=0$ $\Rightarrow \quad \sin 2x = \sin 2y\frac{dy}{dx}$ $\Rightarrow \quad \frac{dy}{dx} = \frac{\sin 2x}{\sin 2y}$	$\frac{1}{2}$ $\frac{1}{2}$
	SECTION B	
5.	$I = \int \frac{\sec^2 x}{(1-\tan x)^2}dx$	

	Put $1 - \tan x = t \Rightarrow \sec^2 x \, dx = -dt$	$\frac{1}{2}$
	$I = -\int \frac{dt}{t^2} = \frac{1}{t} + C = \frac{1}{1 - \tan x} + C$	$1\frac{1}{2}$
	OR	
	$I = \int_0^1 x\,(1-x)^n dx$	
	$= \int_0^1 (1-x) \cdot x^n dx = \int_0^1 (x^n - x^{n+1})dx$	$\frac{1}{2} + \frac{1}{2}$
	$= \left. \frac{x^{n+1}}{n+1} - \frac{x^{n+2}}{n+2} \right]_0^1$	$\frac{1}{2}$
	$= \frac{1}{n+1} - \frac{1}{n+2}$ or $\frac{1}{(n+1)(n+2)}$	$\frac{1}{2}$
6.	$y = b \cos(x + a)$	
	$\Rightarrow \quad \frac{dy}{dx} = -b \sin(x + a)$	$\frac{1}{2}$
	$\frac{d^2y}{dx^2} = -b \cos(x + b)$	1
	$\left.\begin{array}{l} \Rightarrow \quad \frac{d^2y}{dx^2} = -y \\ \text{or} \quad \frac{d^2y}{dx^2} + y = 0 \end{array}\right\}$	$\frac{1}{2}$
7.	$\vec{a} \times \vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 4 & -1 & 8 \\ 0 & -1 & 1 \end{vmatrix} = 7\hat{i} - 4\hat{j} - 4\hat{k}$	1
	Required unit vector $= \frac{(\vec{a} \times \vec{b})}{\lvert \vec{a} \times \vec{b} \rvert}$	
	$= \frac{1}{9}(7\hat{i} - 4\hat{j} - 4\hat{k})$	1

	OR	
	$(\vec{a}+\lambda\vec{b})\perp\vec{c} \Rightarrow (\vec{a}+\lambda\vec{b})\cdot\vec{c} = 0$	$\frac{1}{2}$
	$\Rightarrow \quad [(2-\lambda)\hat{i}+(2+2\lambda)\hat{j}+(3+\lambda)\hat{k}]\cdot(3\hat{i}+\hat{j}) = 0$	$\frac{1}{2}$
	$\Rightarrow \quad 3(2-\lambda) + 1.(2+2\lambda) = 0 \Rightarrow \lambda = 8$	1
8.	$P(A/B) = \frac{P(A\cap B)}{P(B)} = \frac{P(A)\ \cancel{P(B)}}{\cancel{P(B)}}$	1
	$= 0.3$	1
	OR	
	Required probability = $\frac{3}{5}\times\frac{3}{7}+\frac{2}{5}\times\frac{4}{7}=\frac{17}{35}$	1+1
9.	Required probability = 1 – P(problem is not solved)	
	$= 1 - P(A' \cap B' \cap C')$	1
	$= 1 - P(A')\cdot P(B')\cdot P(C')$	$\frac{1}{2}$
	$= 1-\frac{1}{2}\times\frac{2}{3}\times\frac{3}{4}=\frac{3}{4}$	$\frac{1}{2}$
10.	$fof(x) = f(f(x)) = f((3-x^3)^{1/3})$	$\frac{1}{2}$
	$= [3 - \{(3-x^3)^{1/3}\}^3]^{1/3} = x$	$1\frac{1}{2}$
11.	$[1\ \ 2\ \ 1]\begin{bmatrix}4\\x\\2x\end{bmatrix}=O$	1
	$\Rightarrow \quad [4+2x+2x] = O \Rightarrow x = -1$	1
12.	$I = \int\frac{dx}{\sqrt{9-(x+2)^2}}$	1
	$= \sin^{-1}\left(\frac{x+2}{3}\right)+C$	1

	SECTION C	
13.	Put $\sin x = t \Rightarrow \cos x\,dx = dt$	1
	$I = \int \frac{dt}{(t+1)(t+2)}$	
	$= \int\left(\frac{1}{t+1} - \frac{1}{t+2}\right)dt$	1
	$= \log \lvert t+1 \rvert - \log \lvert t+2 \rvert + C$	$1\frac{1}{2}$
	$= \log \lvert \sin x + 1 \rvert - \log \lvert \sin x + 2 \rvert + C$ or $\log\left\lvert\frac{\sin x+1}{\sin x+2}\right\rvert + C$	$\frac{1}{2}$
14.	$I = \int_0^{\pi} \frac{x \sin x}{1+\cos^2 x}dx \quad ...(1)$	
	$I = \int_0^{\pi} \frac{(\pi - x)\cdot \sin x}{1+\cos^2 x}dx \quad ...(2)$	1
	Adding (1) and (2)	
	$2I = \int_0^{\pi} \frac{\pi \sin x}{1+\cos^2 x}dx$	
	$I = \frac{\pi}{2}\int_0^{\pi} \frac{\sin x}{1+\cos^2 x}dx$	$\frac{1}{2}$
	Put $\cos x = t \Rightarrow -\sin x\,dx = dt$	$\frac{1}{2}$
	$\therefore \quad I = \frac{\pi}{2}\int_{-1}^{1} \frac{dt}{1+t^2}$	1
	$= \frac{\pi}{2}[\tan^{-1} t]_{-1}^{1} = \frac{\pi^2}{4}$	$\frac{1}{2}+\frac{1}{2}$
15.	Given equation can be written as	
	$x\,dx = ye^y\sqrt{1+x^2}\,dy$	

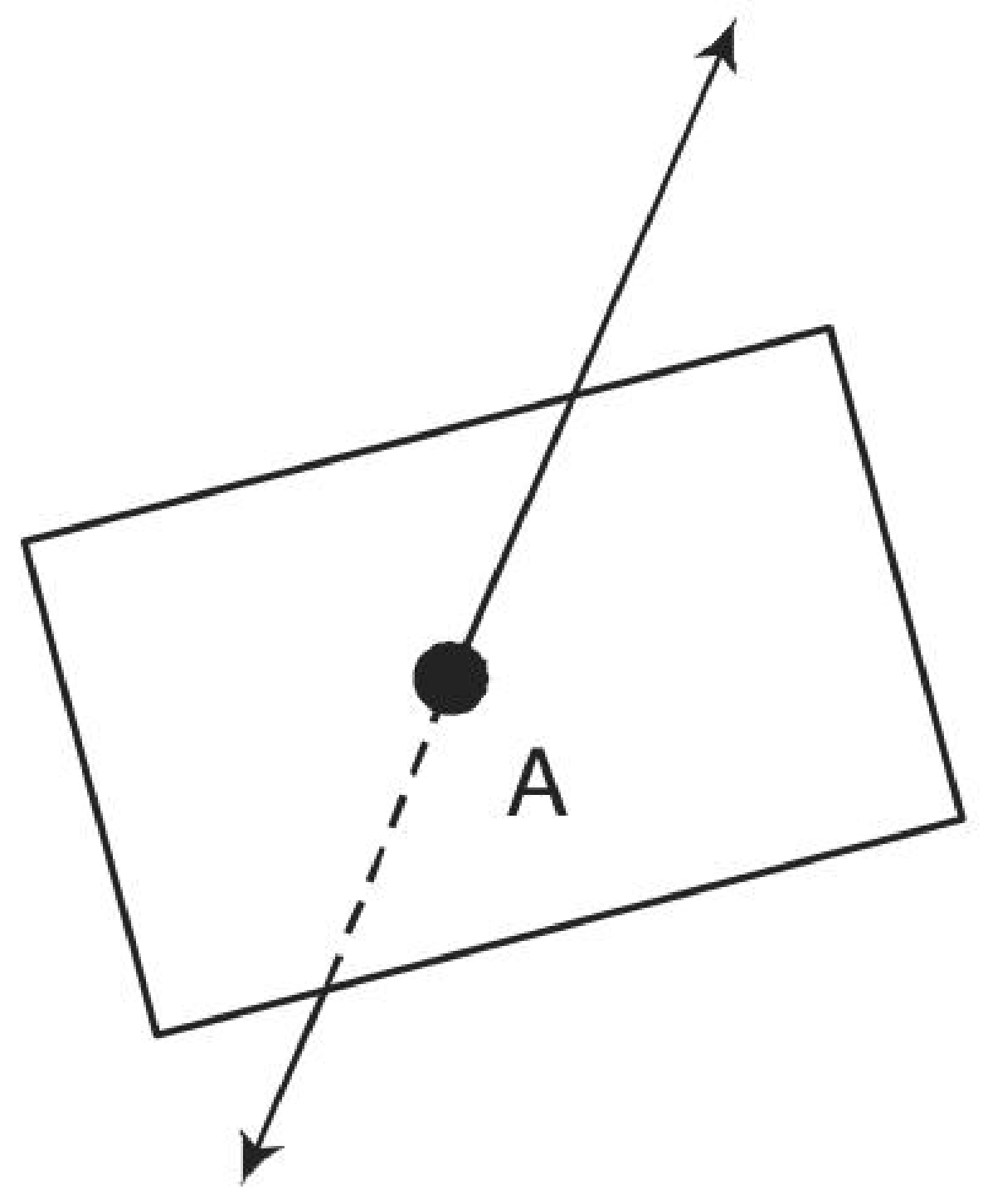
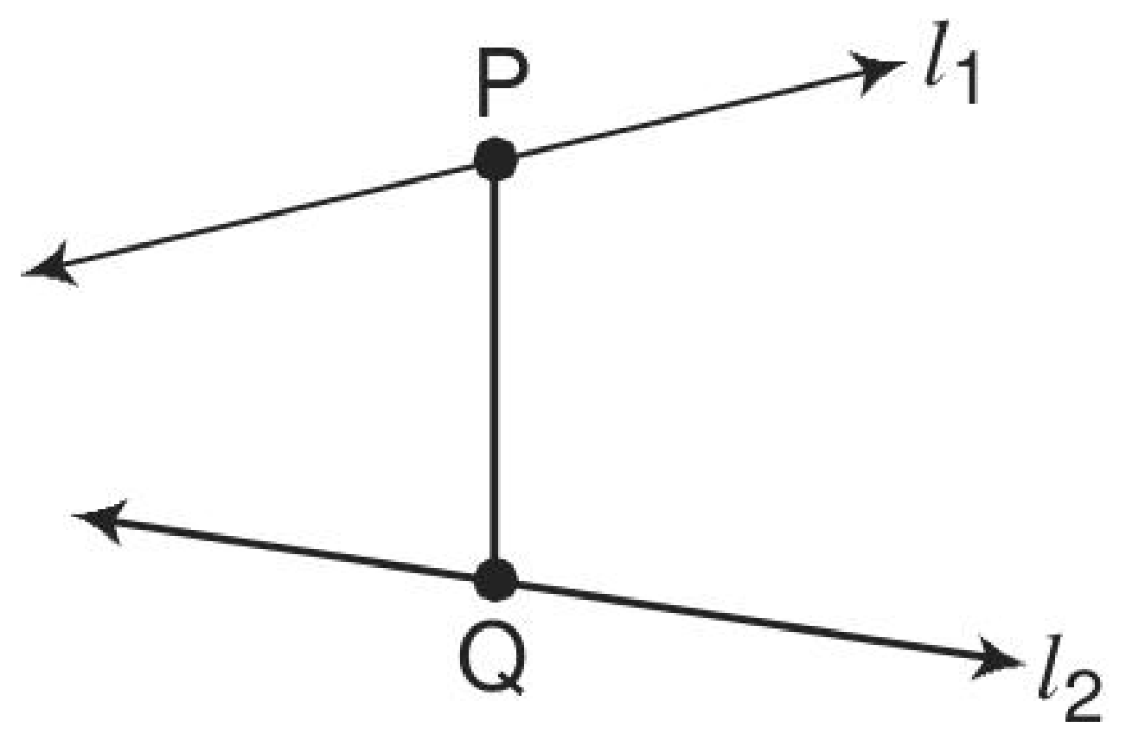
	$\Rightarrow \int \frac{x}{\sqrt{1+x^2}}dx = \int y\cdot e^y dy$	1
	$\Rightarrow \sqrt{1+x^2} = e^y (y-1) + C$	1+1
	when $y = 1$, $x = 0 \Rightarrow C = 1$	$\frac{1}{2}$
	$\therefore$ Required solution is $\sqrt{1+x^2} = e^y(y-1)+1$	$\frac{1}{2}$
	OR	
	Given differential equation can be written as	
	$\frac{dy}{dx} = \frac{y}{x} + \frac{1}{\cos\left(\frac{y}{x}\right)}$	$\frac{1}{2}$
	Put $\frac{y}{x} = v$ i.e. $y = vx$ $\Rightarrow \frac{dy}{dx} = v + x\cdot\frac{dv}{dx}$	1
	Given equation becomes	
	$v + x\frac{dv}{dx} = v + \frac{1}{\cos v}$	$\frac{1}{2}$
	$\Rightarrow \int \cos v\, dv = \int \frac{dx}{x}$	$\frac{1}{2}$
	$\Rightarrow \sin v = \log \lvert x\rvert + c$	1
	$\Rightarrow \sin\left(\frac{y}{x}\right) = \log \lvert x\rvert + c$	$\frac{1}{2}$
16.	Let equation of line is $\vec{r} = (2\hat{i}+3\hat{j}-\hat{k}) + \lambda(a\hat{i}+b\hat{j}+c\hat{k})$	1
	here, $3a + 4b + 2c = 0$ ...(1) $3a - 2b - 2c = 0$ ...(2)	1
	Solving (1) and (2)	
	$\frac{a}{-8+4} = \frac{-b}{-6-6} = \frac{c}{-6-12} = \mu$	

	$\Rightarrow \quad \frac{a}{2} = \frac{b}{-6} = \frac{c}{9} = -2\mu$	1
	$\therefore$ Requried equation of line is $\vec{r} = (2\hat{i} + 3\hat{j} - \hat{k}) + \lambda(2\hat{i} - 6\hat{j} + 9\hat{k})$	1
17.	For reflexive: As $ab = ba$ $\Rightarrow \quad (a, b)\ R(a, b) \qquad \therefore$ R is reflexive	1
	For symmetric: Let $(a, b,)\ R\ (c, d)$ $\Rightarrow \quad ad = bc$ $\Rightarrow \quad cb = da$ $\Rightarrow \quad (c, d)\ R(a, b) \qquad \therefore$ R is symmetric	1
	For transitive: Let $a, b, c, d, e, f \in N$ Let $(a, b)\ R(c, d)$ and $(c, d)\ R(e, f)$ $\Rightarrow \quad ad = bc$ and $cf = de$ $\Rightarrow \quad d = \frac{cf}{e}$ $\therefore \quad a\left(\frac{cf}{e}\right) = bc$ $\Rightarrow \quad acf = bce \Rightarrow af = be$ $\Rightarrow \quad (a, b)\ R(e, f) \qquad \therefore$ R is transitive	$1\frac{1}{2}$
	Since R is reflexive, symmetric and transitive $\therefore$ R is an equivalence relation.	$\frac{1}{2}$
	OR Let $x_1, x_2 \in R - \{2\}$ Let $f(x_1) = f(x_2)$ $\Rightarrow \quad \frac{x_1}{x_1 - 2} = \frac{x_2}{x_2 - 2} \Rightarrow x_1(x_2 - 2) = x_2(x_1 - 2)$	2

	$\Rightarrow x_1 = x_2$ $\Rightarrow$ f is one-one.	
	Now, gof(x) = g(f(x)), $x \in \mathbb{R} - \{2\}$ $= g\left(\frac{x}{x-2}\right)$ $= \frac{2\left(\frac{x}{x-2}\right)}{\frac{x}{x-2}-1} = x$	2
18.	y = a cos (log x) + b sin (log x)	
	$\frac{dy}{dx} = \frac{-a \sin(\log x)}{x} + \frac{b \cos(\log x)}{x}$	1
	$\Rightarrow \quad x \cdot \frac{dy}{dx} = -a \sin(\log x) + b \cos(\log x)$	$\frac{1}{2}$
	differentiate both sides again w.r.t x, $x \cdot \frac{d^2y}{dx^2} + \frac{dy}{dx} \cdot 1 = \frac{-a \cos(\log x)}{x} - \frac{b \sin(\log x)}{x}$	$1\frac{1}{2}$
	$\Rightarrow \quad x \frac{d^2y}{dx^2} + \frac{dy}{dx} = -\frac{y}{x}$	$\frac{1}{2}$
	$\Rightarrow \quad x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$	$\frac{1}{2}$
19.	Put $x = \cos 2\theta \Rightarrow \theta = \frac{1}{2} \cos^{-1} x$	1
	$\text{LHS} = \tan^{-1}\left(\frac{\sqrt{1+\cos 2\theta} + \sqrt{1-\cos 2\theta}}{\sqrt{1+\cos 2\theta} - \sqrt{1-\cos 2\theta}}\right)$	$\frac{1}{2}$
	$= \tan^{-1}\left(\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}\right)$	1
	$= \tan^{-1}\left(\frac{1+\tan\theta}{1-\tan\theta}\right) = \tan^{-1}\left(\tan\left(\frac{\pi}{4} + \theta\right)\right)$	$\frac{1}{2}$

	$= \dfrac{\pi}{4}+\theta=\dfrac{\pi}{4}+\dfrac{1}{2}\cos^{-1}x=\text{RHS}$	1
20.	$x^y \cdot y^x = x^x$	
	$\Rightarrow \quad y \log x + x \log y = x \log x$	1
	differentiate both sides w.r.t. x, $\left(y\cdot\dfrac{1}{x}+\log x\cdot\dfrac{dy}{dx}\right)+\left(x\cdot\dfrac{1}{y}\cdot\dfrac{dy}{dx}+\log y\cdot 1\right) = x\cdot\dfrac{1}{x}+\log x\cdot 1$	2
	$\Rightarrow \quad \dfrac{y}{x}+\log\left(\dfrac{y}{x}\right)-1=-\left(\log x+\dfrac{x}{y}\right)\cdot\dfrac{dy}{dx}$ $\Rightarrow \quad \dfrac{dy}{dx} = \dfrac{1-\dfrac{y}{x}-\log\left(\dfrac{y}{x}\right)}{\log x+\dfrac{x}{y}}$ or $\dfrac{y}{x}\left[\dfrac{x+x\log x-y-x\log y}{y\log x+x}\right]$	1
	OR	
	$\dfrac{dx}{d\theta} = 3a\sec^2\theta\cdot\sec\theta\tan\theta$	1
	$\dfrac{dy}{d\theta} = 3a\tan^2\theta\cdot\sec^2\theta$	1
	$\dfrac{dy}{dx} = \dfrac{\left(\dfrac{dy}{d\theta}\right)}{\left(\dfrac{dx}{d\theta}\right)}=\sin\theta$	1
	Also, $\quad \dfrac{d^2y}{dx^2} = \cos\theta\cdot\dfrac{d\theta}{dx}$ $= \dfrac{\cos\theta}{3a\tan\theta\sec^3\theta}$ or $\dfrac{\cos^5\theta}{3a\sin\theta}$	1
21.	$\left.\begin{array}{l}\overrightarrow{BA}=\hat{i}+(x-4)\hat{j}+4\hat{k}\\ \overrightarrow{BC}=\hat{i}+0\hat{j}-3\hat{k}\\ \overrightarrow{BD}=3\hat{i}+3\hat{j}-2\hat{k}\end{array}\right\}$	$1\frac{1}{2}$
	$[\overrightarrow{BA}\ \ \overrightarrow{BC}\ \ \overrightarrow{BD}] = 0$	

	$\Rightarrow \begin{vmatrix}1 & x-4 & 4\\ 1 & 0 & -3\\ 3 & 3 & -2\end{vmatrix} = 0$	1
	$\Rightarrow 1(9) - (x-4)\cdot 7 + 4(3) = 0$	
	$\Rightarrow x = 7$	$1\frac{1}{2}$
22.	$y^2 = 4ax$	
	differentiating, both sides w.r.t. x,	
	$2y\frac{dy}{dx} = 4a \Rightarrow \frac{dy}{dx} = \frac{2a}{y}$	1
	$\therefore$ slope of tangent at $(at^2, 2at) = \frac{2a}{2at} = \frac{1}{t}$	1
	Equation of tangent is:	
	$y - 2at = \frac{1}{t}(x - at^2)$ $\Rightarrow x - ty + at^2 = 0$	1
	Equation of normal is	
	$y - 2at = -t(x - at^2)$ $\Rightarrow tx + y - 2at - at^3 = 0$	1
23.	LHS: $C_1 \to C_1 + C_3$	
	$= \begin{vmatrix}\alpha+\beta+\gamma & \alpha^2 & \beta+\gamma\\ \alpha+\beta+\gamma & \beta^2 & \gamma+\alpha\\ \alpha+\beta+\gamma & \gamma^2 & \alpha+\beta\end{vmatrix}$	1
	$= (\alpha+\beta+\gamma)\begin{vmatrix}1 & \alpha^2 & \beta+\gamma\\ 1 & \beta^2 & \gamma+\alpha\\ 1 & \gamma^2 & \alpha+\beta\end{vmatrix}$	$\frac{1}{2}$
	$R_1 \to R_1 - R_2,\ R_2 \to R_2 - R_3$	
	$= (\alpha+\beta+\gamma)\begin{vmatrix}0 & \alpha^2-\beta^2 & -(\alpha-\beta)\\ 0 & \beta^2-\gamma^2 & -(\beta-\gamma)\\ 1 & \gamma^2 & \alpha+\beta\end{vmatrix}$	1

	$= (\alpha+\beta+\gamma)(\alpha-\beta)(\beta-\gamma)\begin{vmatrix} 0 & \alpha+\beta & -1 \\ 0 & \beta+\gamma & -1 \\ 1 & \gamma^2 & \alpha+\beta \end{vmatrix}$	$\frac{1}{2}$
	Expanding along C_1	
	$= (\beta - \gamma)(\gamma - \alpha)(\alpha - \beta)(\alpha + \beta + \gamma) = \text{RHS}$	1
	SECTION D	
24.	 Given line $\frac{x-8}{4} = \frac{y-1}{1} = \frac{z-3}{8} = \lambda$	
	Any point on it is $(4\lambda + 8, \lambda + 1, 8\lambda + 3)$	1
	Let A $(4\lambda + 8, \lambda + 1, 8\lambda + 3)$	
	A lies on plane $2x + 2y + z = 3$	
	$\therefore\ 2(4\lambda + 8) + 2(\lambda + 1) + (8\lambda + 3) = 3$	2
	$\Rightarrow \lambda = -1$	
	$\therefore$ A(4, 0, –5)	1
	II part: Let angle between line and plane be θ.	
	Then, $\sin\theta = \frac{4(2)+1(2)+8(1)}{\sqrt{16+1+64}\sqrt{4+4+1}} = \frac{2}{3}$	$1\frac{1}{2}$
	$\Rightarrow \theta = \sin^{-1}\left(\frac{2}{3}\right)$	$\frac{1}{2}$
	OR	
	 Let $P(3\lambda + 7, 2\lambda + 5, \lambda + 3)$ and	$\frac{1}{2}$
	$Q(2\mu + 1, 4\mu - 1, 3\mu - 1)$	$\frac{1}{2}$
	Now, d.r′.s. of PQ = $3\lambda - 2\mu + 6, 2\lambda - 4\mu + 6, \lambda - 3\mu + 4$	1
	According to question,	
	$\frac{3\lambda - 2\mu + 6}{2} = \frac{2\lambda - 4\mu + 6}{2} = \frac{\lambda - 3\mu + 4}{1}$	1
	$\Rightarrow \lambda + 2\mu = 0$ and $2\mu = 2 \Rightarrow \mu = 1$	
	$\Rightarrow \lambda = -2\mu$	

$\therefore\ \mu = 1,\ \lambda = -2$ 1

$\therefore$ P(1, 1, 1) and Q(3, 3, 2)

$PQ = \sqrt{(3-1)^2+(3-1)^2+(2-1)^2} = \sqrt{4+4+1} = 3$ 1

Equation of PQ is $\frac{x-1}{2} = \frac{y-1}{2} = \frac{z-1}{1}$ 1

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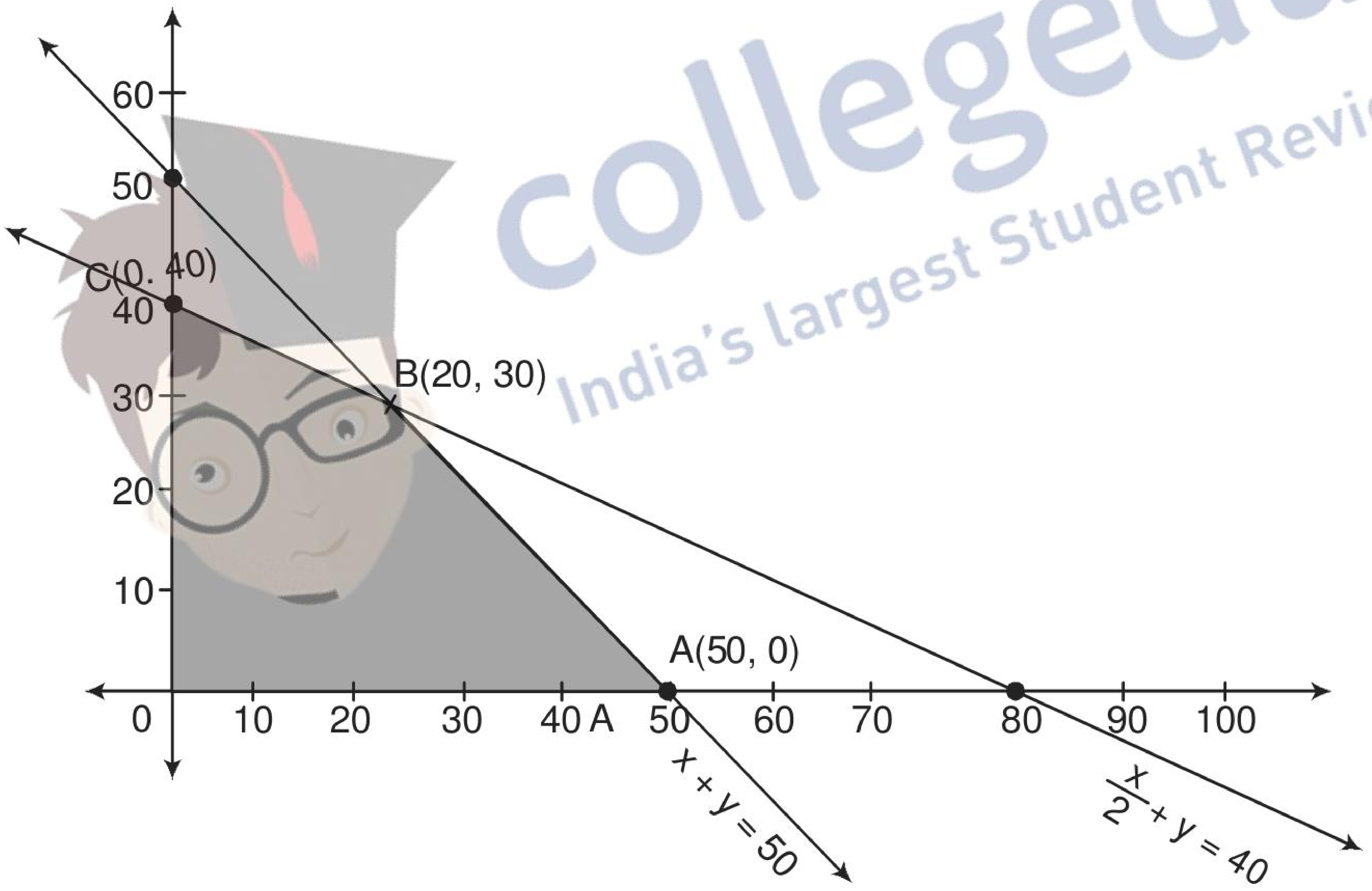
25. Let number of chairs be x and number of tables be y.

Maximize z = 40x + 60y 1

Subject to following constratins:

$$\left.\begin{aligned} & x + y \le 50 \\ & \frac{x}{2} + y \le 40 \\ & x \ge 0,\ y \ge 0 \end{aligned}\right\} \quad 2$$



2

Corner point	z = 40x + 60y
A(50, 0)	2000
B(20, 30)	2600
C(0, 40)	2400

$$\left.\begin{aligned} & \text{Number of chairs manufactured} = 20 \\ & \text{Number of tables manufactured} = 30 \\ & \text{Maximum profit} = ₹\ 2{,}600 \end{aligned}\right\} \quad 1$$

26.	Let E_1: Transferred ball is green E_2: Transferred ball is red A: Green ball is found	1
	Here, $P(E_1) = \frac{2}{6}, P(E_2)=\frac{4}{6}$	1
	$P(A/E_1) = \frac{6}{9}, P(A/E_2)=\frac{5}{9}$	1
	Using Baye's theorem. $P(E_1/A) = \frac{P(E_1)\cdot P(A/E_1)}{P(E_1)\cdot P(A/E_1)+P(E_2)\cdot P(A/E_2)}$ $= \frac{\frac{2}{6}\times\frac{6}{9}}{\frac{2}{6}\times\frac{6}{9}+\frac{4}{6}\times\frac{5}{9}}$	2
	$= \frac{12}{12+20}=\frac{3}{8}$	1
27.	$\lvert A\rvert = -2 \neq 0 \Rightarrow A^{-1}$ exists	$\frac{1}{2}$
	Now, $A_{11} = -1, A_{12} = 8, A_{13} = -5$ $A_{21} = 1, A_{22} = -6, A_{23} = 3$ $A_{31} = -1, A_{32} = 2, A_{33} = -1$	$2\frac{1}{2}$
	$\text{adj } A = \begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$ $A^{-1} = \frac{1}{\lvert A\rvert}\cdot \text{adj } A = \frac{-1}{2}\begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$	1
	Given system of equations can be written as AX = B, where $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and $B=\begin{bmatrix} 5 \\ 10 \\ 9 \end{bmatrix}$	

Now AX = B ⇒ $X = A^{-1}B$ 1

$$= \frac{-1}{2}\begin{bmatrix}-1 & 1 & -1\\ 8 & -6 & 2\\ -5 & 3 & -1\end{bmatrix}\begin{bmatrix}5\\ 10\\ 9\end{bmatrix}$$

$$= \frac{-1}{2}\begin{bmatrix}-4\\ -2\\ -4\end{bmatrix} = \begin{bmatrix}2\\ 1\\ 2\end{bmatrix}$$ $\frac{1}{2}$

∴ $x = 2,\ y = 1,\ z = 2$ $\frac{1}{2}$

OR

A = IA

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

$R_1 \rightarrow \frac{R_1}{3}$

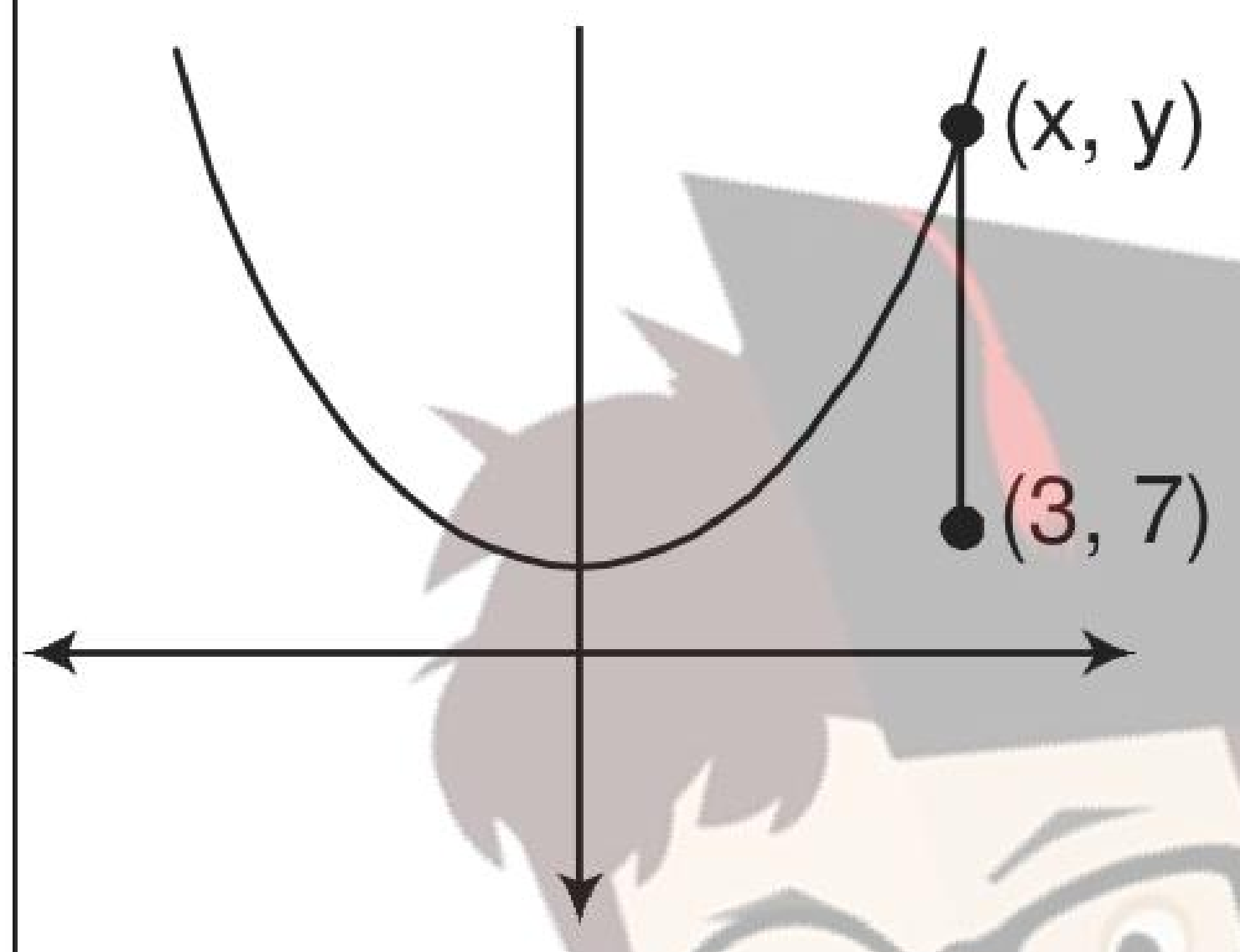
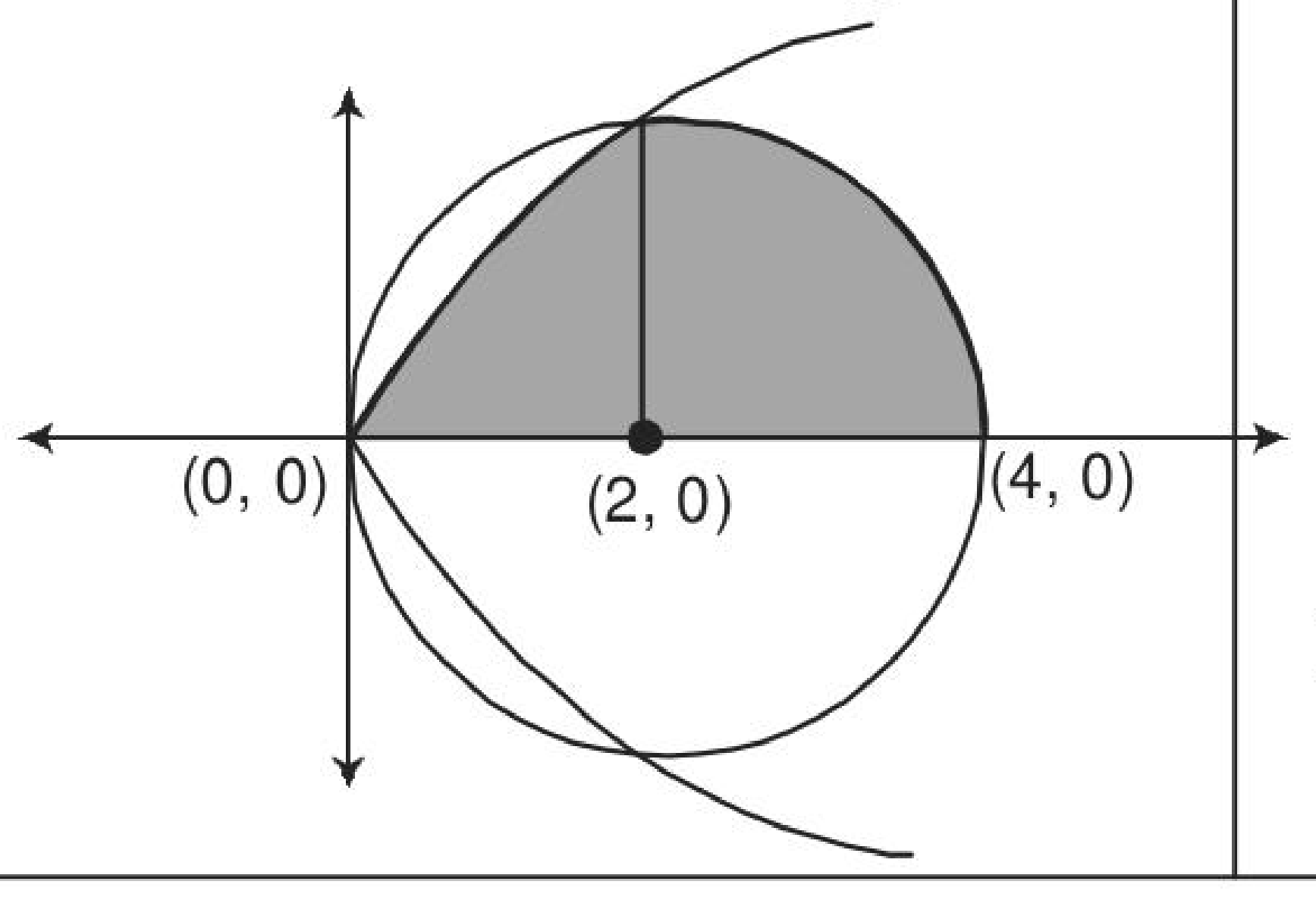
$$\Rightarrow \begin{bmatrix}1 & \frac{-1}{3} & \frac{1}{3}\\ -15 & 6 & -5\\ 5 & -2 & 2\end{bmatrix} = \begin{bmatrix}\frac{1}{3} & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}\cdot A$$

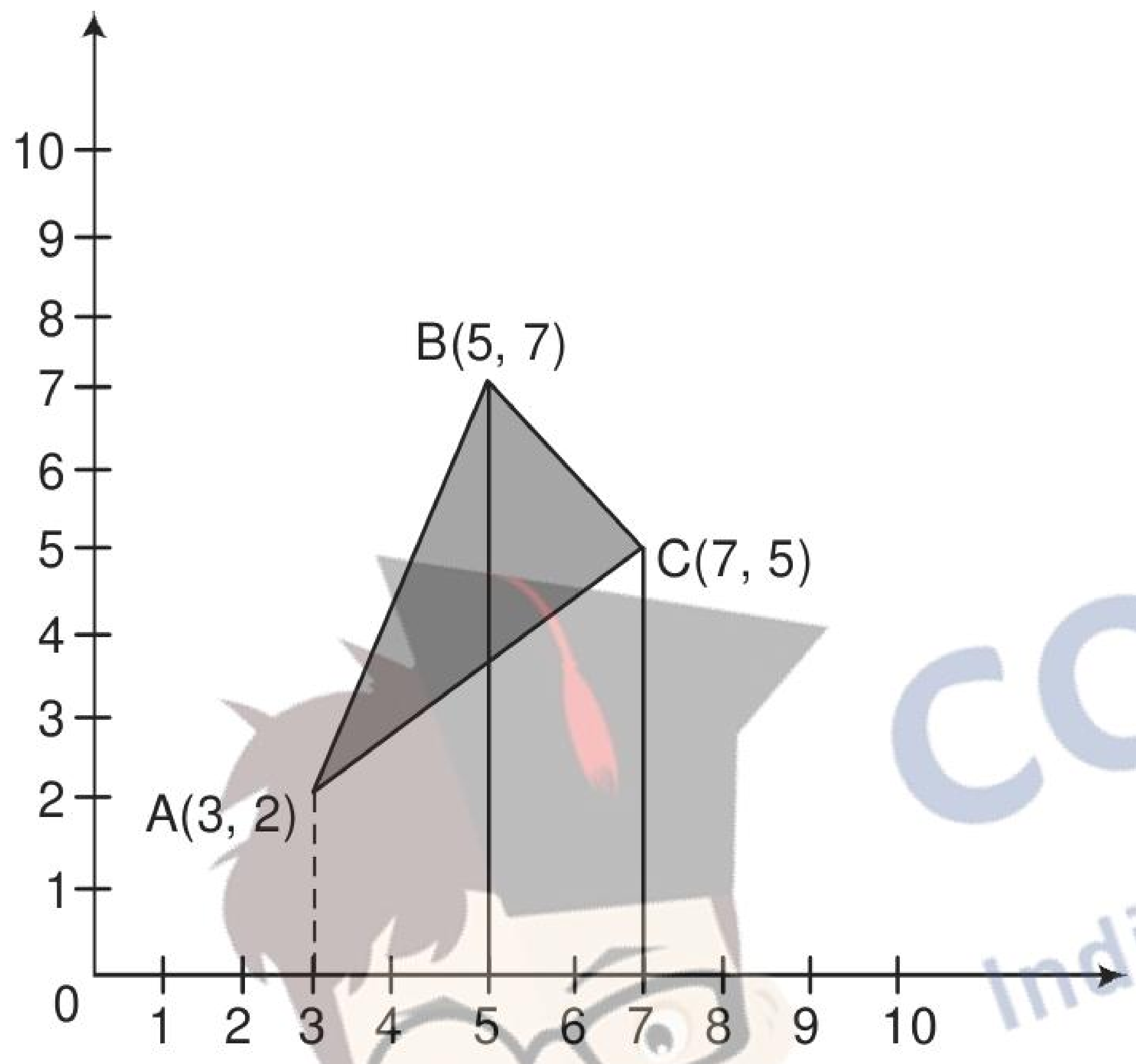
$R_2 \rightarrow R_2 + 15R_1,\ R_3 \rightarrow R_3 - 5R_1$

$$\Rightarrow \begin{bmatrix}1 & \frac{-1}{3} & \frac{1}{3}\\ 0 & 1 & 0\\ 0 & \frac{-1}{3} & \frac{1}{3}\end{bmatrix} = \begin{bmatrix}\frac{1}{3} & 0 & 0\\ 5 & 1 & 0\\ \frac{-5}{3} & 0 & 1\end{bmatrix}\cdot A$$

$R_1 \rightarrow R_1 + \frac{1}{3}R_2,\ R_3 \rightarrow R_3 + \frac{1}{3}R_2$

$$\Rightarrow \begin{bmatrix}1 & 0 & \frac{1}{3}\\ 0 & 1 & 0\\ 0 & 0 & \frac{1}{3}\end{bmatrix} = \begin{bmatrix}2 & \frac{1}{3} & 0\\ 5 & 1 & 0\\ 0 & \frac{1}{3} & 1\end{bmatrix}\cdot A$$ 4

	$R_3 \to 3R_3$ $\Rightarrow \begin{bmatrix}1 & 0 & \frac{1}{3}\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix} = \begin{bmatrix}2 & \frac{1}{3} & 0\\ 5 & 1 & 0\\ 0 & 1 & 3\end{bmatrix}\cdot A$ $R_1 \to R_1 - \frac{1}{3}R_3$ $\Rightarrow \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix} = \begin{bmatrix}2 & 0 & -1\\ 5 & 1 & 0\\ 0 & 1 & 3\end{bmatrix}\cdot A$ $\Rightarrow \quad A^{-1} = \begin{bmatrix}2 & 0 & -1\\ 5 & 1 & 0\\ 0 & 1 & 3\end{bmatrix}$	1
28.	 $S = \sqrt{(x-3)^2 + (y-7)^2}$ $\Rightarrow P = S^2 = (x - 3)^2 + x^4$ $\frac{dP}{dx} = 2(x - 3) + 4x^3$ $\frac{dP}{dx} = 0 \Rightarrow 2x^3 + x - 3 = 0$ $\Rightarrow (x - 1)(2x^2 + 2x + 3) = 0 \Rightarrow x = 1$ $\frac{d^2P}{dx^2} = 6x^2 + 1 > 0$ at $x = 1$ $\Rightarrow x = 1$ will give minimum distance. Minimum distance = $\sqrt{4+1} = \sqrt{5}$	1 1 1 1 1 1
29.	$x^2 + y^2 = 4x \Rightarrow (x - 2)^2 + y^2 = 4$ ...(1) also, $y^2 = 2x$ ...(2) Solving (1) and (2) point of intersections are (0, 0) and (2, ±2). Correct Figure 	1 1

	Required Area	
	$= \int_0^2 \sqrt{2}\cdot\sqrt{x}\,dx + \int_2^4 \sqrt{4-(x-2)^2}\,dx$	1
	$= \frac{2}{3}\sqrt{2}\,[x^{3/2}]_0^2 + \left[\frac{x-2}{2}\sqrt{4-(x-2)^2} + 2\sin^{-1}\left(\frac{x-2}{2}\right)\right]_2^4$	2
	$= \frac{2}{3}\sqrt{2}\cdot 2^{3/2} + [2\sin^{-1}1 - 2\sin^{-1}0]$	
	$= \frac{8}{3} + \pi$	1
	OR	
		
	Correct Figure	1
	Equation of AB: $y = \frac{1}{2}(5x-11)$	
	Equation of BC: $y = -x + 12$	$1\frac{1}{2}$
	Equation of AC: $y = \frac{1}{4}(3x-1)$	
	Required area	
	$= \int_3^5 \frac{1}{2}(5x-11)dx + \int_5^7 (-x+12)dx - \int_3^7 \frac{1}{4}(3x-1)dx$	1
	$= \frac{1}{2}\frac{(5x-11)^2}{2\times 5}\Bigg]_3^5 + \frac{(12-x)^2}{-2}\Bigg]_5^7 - \frac{1}{4}\cdot\frac{(3x-1)^2}{6}\Bigg]_3^7$	$1\frac{1}{2}$
	$= \frac{1}{20}(196-16) - \frac{1}{2}(25-49) - \frac{1}{24}(400-64)$	
	$= 7$	1