Pre-Board -1 Exam (2025-26)

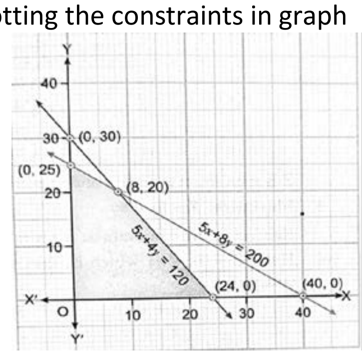
Class-XII

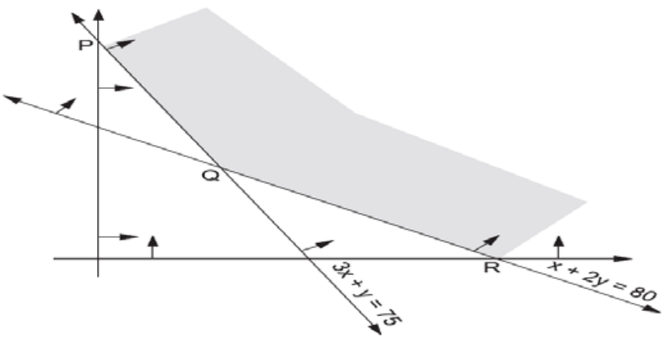
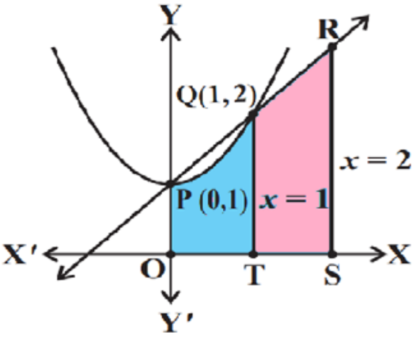
Subject-Mathematics

MARKING SCHEME

SECTION A		
1.	(d)	1
2.	(c)	1
3.	(b)	1
4.	(d)	1
5.	(a)	1
6.	(b)	1
7.	(b)	1
8.	(d)	1
9.	(a)	1
10.	(a)	1
11.	(c)	1
12.	(d)	1
13.	(c)	1
14.	(d)	1
15.	(a)	1
16.	(a)	1
17.	(c)	1
18.	(a)	1
19.	c) (A) is True but (R) is False	1
20.	(a)Both A and R are True and R is the correct Explanation of A	1
SECTION B		
21.	$\cot^{-1}(-1)+\text{cosec}^{-1}(-\sqrt{2})=\left(\pi-\frac{\pi}{4}\right)+\left(-\frac{\pi}{4}\right)=\frac{3\pi}{4}-\frac{\pi}{4}$ $=\frac{\pi}{2}$ OR $\cos^{-1}\left(\cos\frac{13\pi}{6}\right)=\cos^{-1}\cos\left(2\pi+\frac{\pi}{6}\right)=\cos^{-1}\cos\pi/6$ $=\cos^{-1}\frac{\sqrt{3}}{2}=\frac{\pi}{6}$	½+1/2 1 1 1
22	Getting $f'(x)=xe^x$, $for\ all\ x>0$ $f'(x)>0\ forall\ x>0\ since\ x>0\ and\ e^x>0$ $Therefore\ f(x) is\ strictly\ increasing\ for\ x>0$	1 1
23.	$Find\ the\ derivative\ of\ p(x)\ as\ p'(x)=72-2x$ $p'(x)=0$ $x=36$ $p''(x)=-2<0\ for\ x=36$ $profit=\ Rs\ 1337$ OR Let V be the volume, S be the total surface area and a be the edge of the cube.	½ ½ 1/2 ½ ½

	$\frac{dV}{dt} = k$ V=a^3 S= $6a^2$ dS/dt = 12a da/dt da/dt= $\frac{k}{3a^2}$ dS/dt= $\frac{4k}{a}$	1/2 1/2 1/2
24.	Let I = $\int_0^{\frac{\pi}{2}} x\cos x\, dx$ $= [x\sin x]_0^{\frac{\pi}{2}} - \int_0^{\frac{\pi}{2}} 1.\sin x\, dx$ $= [x\sin x]_0^{\frac{\pi}{2}} + [\cos x]_0^{\frac{\pi}{2}}$ $= \left(\frac{\pi}{2} - 0\right) + (0-1)$ $= \frac{\pi}{2} - 1$	1 ½ 1/2
25.	Solution. f(x) = sin 2x, $0 \le x \le 2\pi \implies f'(x) = 2cos2x, 0 < x < \pi$ $f'(x) = 0 \Rightarrow 2x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \frac{7\pi}{2} \Rightarrow x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ f(0) = 0, f($\frac{\pi}{4}$) $= 1, f\left(\frac{3\pi}{4}\right) = -1, f\left(\frac{5\pi}{4}\right) = 1, f\left(\frac{7\pi}{4}\right) = -1, Max\ f(x) =$ $1\ which\ is\ attained\ at \frac{\pi}{4}, 5\pi/4$	1 0.5 0.5
SECTION C		
26.	$Using\ \ Partial\ Fractions\ \frac{(3x+1)}{(x-2)^2(x+2)} = \frac{A}{x-2} + \frac{B}{(x-2)^2} + \frac{C}{x+2}$ Getting the values A= 5/16 , B=7/4, C=$^{-5}/_{16}$ I=$\frac{5}{16}\log(x-2)$-$\frac{7}{4(x-2)} - \frac{5}{16}\log(x+2)$ + C	0.5 1 1.5
27	Let $E_1 = event\ that\ A\ solves\ the\ problem$ $E_2 = event\ that\ \ B\ solves\ the\ problem$ $Getting\ P(E_1 \cap E_2) = \frac{1}{6}$, $E_1\ and\ \ E_2\ are\ independent\ events$ $Getting\ \ P(the\ problem\ is\ solved) = P(E_1 or\ E_2) = \frac{2}{3}$ $Getting\ P(exactly\ one\ of\ them\ solves\ the\ problem)$ $= P(E_1)P(\overline{E_2}) + P(E_2)P(\overline{E_1}) = \frac{1}{2}$	0.5 1 1.5
28	Applying property $\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$ $Let\ \ I = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{cotx}} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\cot\left(\frac{\pi}{3}+\frac{\pi}{6}-x\right)}}$…..(1) I=$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{tanx}}$ =$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{cotx}\,dx}{1+\sqrt{cotx}}$……………..(2) Adding (1) and (2) 2I= $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} dx$=$\frac{\pi}{3} - \frac{\pi}{6}$= $\frac{\pi}{6}$ I= $\frac{\pi}{12}$ **OR** Using integration by parts	½ 1/2 1/2 1 ½

	$\int uv\,dx = u\int v\,dx - \int\left\{\frac{d}{dx}u\int v\,dx\right\}dx$ $taking\ u = \tan^{-1}x\ \ and\ \ v = x$ $Let\ I = \int x\tan^{-1}x\,dx$ $I = \int x\tan^{-1}x\ dx = \tan^{-1}x\int x\,dx - \int\left\{\frac{d}{dx}\tan^{-1}x\int x\,dx\right\}dx$ $getting\ \ I = x^2\frac{\tan^{-1}x}{2} - \frac{1}{2}\int\left(1-\frac{1}{1+x^2}\right)dx$ $getting\ I = \frac{1}{2}(1+x^2)\tan^{-1}x - \frac{1}{2}x + C$	1 0.5 1 0.5
29	$getting\ the\ form\ of\ LDE:\ \ \frac{dy}{dx} + Py = Q$ $\frac{dy}{dx} + \frac{y}{1+x^2} = \frac{e^{\tan^{-1}x}}{1+x^2}$ $P = \frac{1}{1+x^2}\ \ and\ \ Q = \frac{e^{\tan^{-1}x}}{1+x^2}$ $getting\ IF = e^{\int P dx} = e^{\tan^{-1}x}$ $Required\ solution:\ \ y \times IF = \int Q \times IF\,dx + C$ $y \times\ e^{\tan^{-1}x} = \int\frac{e^{2\tan^{-1}x}}{1+x^2}dx + C$ $solving\ the\ integral\ and\ getting$ $y = \frac{1}{2}e^{\tan^{-1}x} + Ce^{-\tan^{-1}x}$ OR x dy - y dx = $\sqrt{x^2+y^2}$ dx $\frac{dy}{dx} = \frac{\sqrt{x^2+y^2}+y}{x}$,$x \neq 0$ It is a homogeneous diff. Eqn. Put y = vx and $\frac{dy}{dx}$ = v+x$\frac{dv}{dx}$ $\frac{dv}{\sqrt{1+v^2}} = \frac{dv}{x}$ Integrated on both sides,we get log$\lvert v+\sqrt{1+v^2}\rvert$ =log$\lvert x\rvert + logC$ $\left\lvert\frac{y}{x}+\sqrt{1+\frac{y^2}{x^2}}\right\rvert = \lvert Cx\rvert$ $(y+\sqrt{x^2+y^2})^2 = C^2x^2$	1/2 1 ½ 1 1/2 1 1 1/2
30	Plotting the constraints in graph  Corner points(0,0),(24,0),(8,20),and (0,25) At(0,0) Z=0	

	At(0,25) Z=3000 At(24,0) Z=2400 At(8,20) Z=3200 (Maximum) Maximum value of Z is Rs.3200 at point (8,20) OR  For correct graph At (14, 33) minimum occurs Min z= 254	1.5 0.5 1 1.5 0.5 1
31	$\frac{dx}{dt} = 3cost - 3cos3t$ $\frac{dy}{dt} = -3sint + 3sin3t$ $finding\ \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = cot2t$ $\frac{d^2y}{dx^2} = \frac{-2\ cosec^2 2t}{3(cost - cos3t)}$ $at\ t = \frac{\pi}{3}$ $\frac{d^2y}{dx^2} = -16/27$	0.5 1 1 0.5
	SECTION D	
32	 For correct figure Required Area=$\int_0^1 (x^2 + 1)\,dx + \int_1^2 (x + 1)dx$ $= \frac{23}{6}$	1 1 1 1 1

33	For proving the relation as reflexive For proving the relation as symmetric For proving the relation as transitive Equivalence class of (2,5) = {(a,b): (2,5)R(a,b)}⇔ $2+b=5+a$ $b-a=3$ $=\{(1,4)(2,5),(3,6),(4,7),(5,8),(6,9)\}$ OR To prove f is one-one To prove f is onto Hence f is one-one onto function ,therefore f is bijective	1 1 1.5 0.5 1 2 2.5 0.5
34	$Given\ equations$: $x+3y+4z=8, 2x+y+2z=5, 5x+y+z=7$ Writing equations as $\begin{bmatrix}1 & 3 & 4\\2 & 1 & 2\\5 & 1 & 1\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}8\\5\\7\end{bmatrix}$ AX=B Finding $\|A\|=11\neq 0$ $A^{-1}=\frac{adj\ A}{\|A\|}=\frac{1}{11}\begin{bmatrix}-1 & 1 & 2\\8 & -19 & 6\\-3 & 14 & -5\end{bmatrix}$ X = A^{-1} B $\begin{bmatrix}x\\y\\z\end{bmatrix}=\frac{1}{11}\begin{bmatrix}-1 & 1 & 2\\8 & -19 & 6\\-3 & 14 & -5\end{bmatrix}\begin{bmatrix}8\\5\\7\end{bmatrix}$ $\begin{bmatrix}x\\y\\z\end{bmatrix}=\frac{1}{11}\begin{bmatrix}11\\11\\11\end{bmatrix}=\begin{bmatrix}1\\1\\1\end{bmatrix}$ $x=1,\quad y=1,\quad z=1$	 1 1 2 1
35	$\overrightarrow{a_2}-\overrightarrow{a_1}=\hat{\imath}-\hat{k}$ $\overrightarrow{b_1}\ X\ \overrightarrow{b_2}=3\hat{\imath}-\hat{\jmath}-7\hat{k}$ $\left\|\overrightarrow{b_1}\ X\ \overrightarrow{b_2}\right\|=\sqrt{59}$ $(\overrightarrow{a_2}-\overrightarrow{a_1}).(\overrightarrow{b_1}\ X\ \overrightarrow{b_2})$= 10 S.D.=$\frac{\left\|(\overrightarrow{a_2}-\overrightarrow{a_1}).(\overrightarrow{b_1}\ X\ \overrightarrow{b_2})\right\|}{\left\|\overrightarrow{b_1}\ X\ \overrightarrow{b_2}\right\|}=\frac{10}{\sqrt{59}}$ OR The given lines are $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}=\lambda$ And $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}=\mu$ $General\ point\ on\ line\ (1);\quad (3\lambda-1,\quad 5\lambda-3, 7\lambda-5)$ $General\ point\ on\ line\ (2);\quad (\mu+2, 3\mu+4, 5\mu+6)$ Forming equations $3\lambda-\mu=3$ $5\lambda-3\mu=7$	0.5 1 1 1 1.5 1/2 ½ ½ 1

	$7\lambda - 5\mu = 11$ Solving the first two equations $\lambda = \frac{1}{2}$, $\mu = -\frac{3}{2}$ These values satisfy third equation. Hence the lines intersect. Point of intersection: $\left(\frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}\right)$	1 ½ 1
SECTION E		
36	(i) $X+2y+\pi\frac{x}{2} = 10$ (ii) $X = \frac{20}{4+\pi}$ OR $Y = \frac{10}{4+\pi}$ (iii) Area of window = $\frac{200+50\pi}{(4+\pi)^2}$	(1) (1) (2)
37	(i) $\sqrt{69}$ units (ii) 2 units (iii) Getting correct values of $\overrightarrow{F_1} + \overrightarrow{F_2}$ and $\overrightarrow{d_2} - \overrightarrow{d_1}$ Getting work done = 40 Units OR Getting $\overrightarrow{d_1} \times \vec{d}_2 = -10\hat{\imath} + 14\hat{\jmath} - 6\hat{k}$ Required unit vector= $\frac{-10\hat{\imath} + 14\hat{\jmath} - 6\hat{k}}{\sqrt{332}}$	1 1 2
38	(i) $p(E_1)=60/100=3/5$, $p(E_2)=40/100=2/5$, $p(A/E_1)=2/100=1/50$, $p(A/E_2)=1/100$ $P(A)=p(E_1).p(A/E_1) + p(E_2).p(A/E_2)=2/125$ (ii) $P(E_1/A)$= ¾ (by using Bayes'Theorem)	(1) (1) (2)