केंद्रीय विद्यालय संगठन, अहमदाबाद संभाग

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प्री-बोर्ड परीक्षा 2025–26

PRE BOARD-I 2025-26

SUBJECT: MATHEMATICS (041) **M.M.: 80**

CLASS: XI **TIME: 3 HOURS**

ANSWER KEY

SET-1 (A)

SECTION A

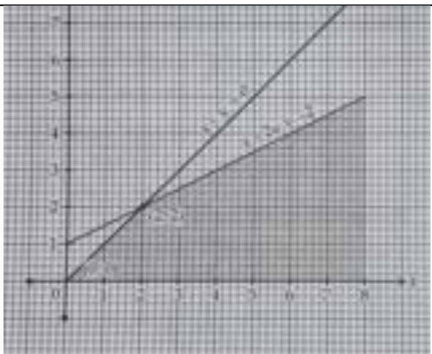
1	(c) $\frac{\pi}{3}$	1
2	(b) 64	1
3	(a)8	1
4	(d)a scalar matrix	1
5	(b)=1	1
6	(d) R - $\{4\}$	1
7	(c)$-2\sqrt{\pi}$	1
8	(b) 2	1
9	**(b)** $\boldsymbol{tan\ (xe^x) + C}$	1
10	(d)(2,∞)	1
11	(b) 0	1
12	(c) (3,3)	1
13	(d) q=3p	1
14	(c)12	1
15	(c) $\frac{\pi}{3}$	1
16	(b) $\vec{a} \perp \vec{b}$	1
17	(d)(4,0)	1
18	(c) $\frac{2}{3}$	1
19	(d) Assertion(A) is false but reason(R) is true	1
20	(c) Assertion (A) is true but reason(R) is false.	1

	SECTION B	
21	Substitute $x = tan(\theta)$ $sin^{-1}\left(\frac{tan\,\theta}{sec\theta}\right)=$ $sin^{-1}(sin\theta)=\theta$ $= tan^{-1}x$ **OR** $-1 \leq -x^2 \leq 1$ $(i) x^2 \geq -1$ This is true for all real numbers, as the square of any real number is non-negative. (ii) $-1 \leq -x^2$ $1 \geq x^2$, $-1 \leq x \leq 1$ The domain of the function is **[−1,1]**	1 1 0.5 0.5 1
22	Taking log both side $logx = \frac{y}{x}$ Differentiate both side w.r.t. x $\frac{1}{x}=\frac{y-x\frac{dy}{dx}}{y^2}$ $\frac{dy}{dx}=\frac{xy-y^2}{x^2}=\frac{y(x-y)}{x^2}=$ Substitute $y = \frac{x}{logx}$ $\frac{dy}{dx} = \frac{x-y}{xlogx}$	1 1
23	$u = 2^{cos^2x}$, $v = cos^2x$ $\frac{du}{dx} = 2^{cos^2x}(log2)(-2cosxsinx)$, $\frac{dv}{dx} = (-2cosxsinx)$ $\frac{du}{dv} = \frac{\frac{du}{dx}}{\frac{dv}{dx}} = 2^{cos^2x}(log2)$	1 1
24	Put $\sqrt{x} = t, dx = 2tdt$ $\int_0^{\frac{\pi}{2}} sint\, dt$ $=2[-cost]_0^{\frac{\pi}{2}} = 2(0-1) = -2$ **OR** Put $1+2x = t^2$, $x = \frac{t^2-1}{2}$ $2dx = 2tdt, dx = tdt$ $= \int \frac{t^2-1}{2} t\, tdt = \frac{1}{2}\int t^4 - t^2 dt$ $= \frac{1}{2}\left(\frac{t^5}{5} - \frac{t^3}{3}\right) + c$ $\frac{1}{2}\left(\frac{(1+2x)^{5/2}}{5} - \frac{(1+2x)^{3/2}}{3}\right) + c$	1 1 1 1

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>25</td><td>$l = m = n = cos\alpha$,
$l^2 + m^2 + n^2 = 1$
$cos\alpha = \pm\frac{1}{\sqrt{3}}$
Vector
$\vec{a} = 5\sqrt{3}\left(\pm\frac{1}{\sqrt{3}}\hat{\imath} \pm \frac{1}{\sqrt{3}}\hat{\jmath} \pm \frac{1}{\sqrt{3}}\hat{k}\right)$
$\vec{a} = 5(\hat{\imath} + \hat{\jmath} + \hat{k})$</td><td>1

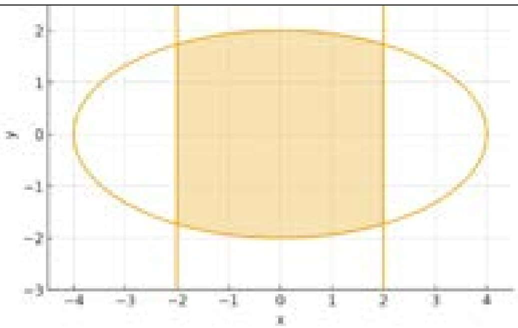
1</td></tr>
<tr><td></td><td>SECTION C</td><td></td></tr>
<tr><td>26</td><td>$V = \frac{4}{3}\pi r^3$
Differentiating both side with respect to t
$\frac{dr}{dt} = \frac{1}{4\pi}\ cm/s$
Now S be the surface area of the sphere at any time t
$s = 4\pi r^2$
$\frac{ds}{dt} = 8\pi r\frac{dr}{dt}$

$\frac{ds}{dt} = 10cm^2/s$</td><td>½
1
½
½

½</td></tr>
<tr><td>27</td><td>
<table><tr><td>Corner point</td><td>Value of z</td></tr><tr><td>O(0,0)</td><td>0</td></tr><tr><td>A(2,2)</td><td>6</td></tr></table>
Since feasible region is unbounded. Plot x + 2y > 6 which has common region with feasible region, thus Z has no maximum value.</td><td>1

½

½</td></tr>
<tr><td>28</td><td>$x = a\left(cos\theta + logtan\frac{\theta}{2}\right)$
Differentiating w.r.t θ
$\frac{dx}{d\theta} = acot\theta cos\theta$
and $y = sin\theta$,
$\frac{dy}{d\theta} = cos\theta$
$\frac{dy}{dx} = \frac{tan\theta}{a}$</td><td>1
0.5
0.5</td></tr>
</table>

	$\frac{d^2y}{dx^2} = \frac{sec^3\theta tan\theta}{a^2}$ $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{4} = \frac{2\sqrt{2}}{a^2}$ OR $y = (tan^{-1}x)^2$ Differentiate w.r.t x $\frac{dy}{dx} = \frac{2tan^{-1}x}{1+x^2}$ $(1+x^2)\frac{dy}{dx} = 2tan^{-1}x$ Again differentiate w.r.t x $(x^2+1) \quad y_2 + 2xy_1 = \frac{2}{1+x^2}$ $(x^2+1)^2y_2 + 2x(x^2+1)y_1 = 2$	0.5 0.5 1 0.5 1 0.5
29	 Area=$4\int_0^2 ydx = 4\int_0^2 \frac{1}{2}\sqrt{4^2-x^2}dx$ $= 2\left[\frac{x}{2}\sqrt{4^2-x^2} + 8sin^{-1}\left(\frac{x}{4}\right)\right]_0^2$ $2\left[\sqrt{12} + \frac{8\pi}{6}\right] = 4\sqrt{3} + \frac{8\pi}{3}$ Type equation here. OR Required area $A = \int_0^4 x(4-x)dx + \left\|\int_4^5 x(4-x)dx\right\|$ $A = \left[2x^2 - \frac{x^3}{3}\right]_0^4 + \left\|\left[2x^2 - \frac{x^3}{3}\right]_4^5\right\|$ =32/3 +7/3= 13 sq. units.	1 1 1 1 1 1
30	That the dr ' of given lines are not proportional so, they are not parallel lines. $(a_2 - a_1) = \hat{j} - 4\hat{k}$ $(b_1 \times b_2) = 2\hat{i} - 4\hat{j} - 3\hat{k}$ Consider $(a_2 - a_1).(b_1 \times b_2) = 8 \neq 0$ Hence line will not intersect. So the lines are skew. Shortest distance=$\left\|\frac{(a_2-a_1).(b_1\times b_2)}{\|b_1\times b_2\|}\right\| = \frac{8}{\sqrt{4+16+9}} = \frac{8}{\sqrt{29}}$ units OR Let the wicket keeper divides the line segment in ratio k:1 $\vec{W} = \frac{k.\vec{F} + 1.\vec{B}}{k+1}$ $6\hat{i} + 12\hat{j} = \left(\frac{12k+2}{k+1}\right)\hat{i} + \left(\frac{18k+8}{k+1}\right)\hat{j}$	½ ½ ½ ½ 1 1 1

	On comparing the components, we get $6=\left(\frac{12k+2}{k+1}\right)$, $k=\frac{2}{3}$	1
31	E= the first die showed an even number. F= the sum of the numbers on the dice is 9= {(6,3), (3,6), (5,4), (4,5)} E∩F={(6,3), (4,5)} n(S)=36, n(E)= 18, n(F)=4 n(E∩F)= 2 $P\left(\frac{E}{F}\right)=\frac{P(E\cap F)}{P(F)}=\frac{2/36}{4/36}=\frac{1}{2}$ Type equation here.	 1 1 1
	SECTION D	
32	**Solution** The given differential equation can be written as $$\frac{dx}{dy}+\frac{x}{1+y^2}=\frac{\tan^{-1}y}{1+y^2} \quad ...(1)$$ Now (1) is a linear differential equation of the form $\frac{dx}{dy}+P_1x=Q_1$, where, $P_1=\frac{1}{1+y^2}$ and $Q_1=\frac{\tan^{-1}y}{1+y^2}$. Therefore, $I.F=e^{\int\frac{1}{1+y^2}dy}=e^{\tan^{-1}y}$ Thus, the solution of the given differential equation is $$xe^{\tan^{-1}y}=\int\left(\frac{\tan^{-1}y}{1+y^2}\right)e^{\tan^{-1}y}dy+C \quad ...(2)$$ Let $I=\int\left(\frac{\tan^{-1}y}{1+y^2}\right)e^{\tan^{-1}y}dy$ Substituting $\tan^{-1}y=t$ so that $\left(\frac{1}{1+y^2}\right)dy=dt$, we get $I=\int te^t dt=te^t-\int 1\,.\,e^t dt=te^t-e^t=e^t(t-1)$ or $I=e^{\tan^{-1}y}(\tan^{-1}y-1)$ Substituting the value of I in equation (2), we get $x\,.\,e^{\tan^{-1}y}=e^{\tan^{-1}y}(\tan^{-1}y-1)+C$ or $x=(\tan^{-1}y-1)+Ce^{-\tan^{-1}y}$ which is the general solution of the given differential equation.	1 1 1 1 1
33	$(kA)\left(\frac{1}{k}A^{-1}\right)=k\frac{1}{k}(AA^{-1})=I$ $(kA)^{-1}=\frac{1}{k}A^{-1}$. Hence calculate $(3A)^{-1}=\frac{1}{3}A^{-1}$, $A=\begin{bmatrix}2&-1&1\\-1&2&-1\\1&-1&2\end{bmatrix}$ $\det(A)=4\neq0$, A^{-1}exist $adjA=\begin{bmatrix}3&1&-1\\1&3&1\\-1&1&3\end{bmatrix}$	 1 ½ ½ 2

	$A^{-1} = \frac{1}{4}\begin{bmatrix} 3 & 1 & -1 \\ 1 & 3 & 1 \\ -1 & 1 & 3 \end{bmatrix}$	½
	$(3A)^{-1} = \frac{1}{3}A^{-1} = \frac{1}{12}\begin{bmatrix} 3 & 1 & -1 \\ 1 & 3 & 1 \\ -1 & 1 & 3 \end{bmatrix}$	½
34	(a) $I = \int \frac{\cos x}{(4+\sin^2 x)(5-4\cos^2 x)}dx$ $= \int \frac{\cos x}{(4+\sin^2 x)(1+4\sin^2 x)}dx$	1
	Let, $\sin x = t \Rightarrow \cos x\, dx = dt$ $I = \frac{dt}{(4+t^2)(1+4t^2)}$ $= -\frac{1}{15}\int \frac{dt}{4+t^2} + \frac{4}{15}\int \frac{dt}{1+4t^2}$ ($\because$ using partial fraction)	1
	For the second term, let $u = 2t$, so $du = 2dt$. $I = -\frac{1}{15}\cdot\frac{1}{2}\tan^{-1}\left(\frac{t}{2}\right) + \frac{4}{15}\int \frac{1}{1+u^2}\frac{du}{2}$	1
	$I = -\frac{1}{30}\tan^{-1}\left(\frac{t}{2}\right) + \frac{2}{15}\tan^{-1}(u) + C$ $I = -\frac{1}{30}\tan^{-1}\left(\frac{t}{2}\right) + \frac{2}{15}\tan^{-1}(2t) + C$	1
	Substitute back $t = \sin x$. $I = -\frac{1}{30}\tan^{-1}\left(\frac{\sin x}{2}\right) + \frac{2}{15}\tan^{-1}(2\sin x) + C$	1
	OR	
	$I = \int_0^{\pi} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x}$ $= 2\int_0^{\frac{\pi}{2}} \frac{dx}{a^2\cos^2 x + b^2\sin^2 x}$ $= 2\int_0^{\frac{\pi}{2}} \frac{\sec^2 x}{a^2 + b^2\tan^2 x}dx$	1.5
	$\tan x = t$ $\sec^2 x\, dx = dt$ $x = 0 \Rightarrow t = 0$ $x = \frac{\pi}{2} \Rightarrow t = \infty$ $I = 2\int_0^{\infty} \frac{dt}{a^2 + b^2t^2}$	1
	$= \frac{2}{b^2}\cdot\frac{b}{a}\left[\tan^{-1}\left(\frac{bt}{a}\right)\right]_0^{\infty}$	1
	$= \frac{2}{ab}\left(\frac{\pi}{2} - 0\right) = \frac{\pi}{ab}$	1+0.5

35	$\frac{x}{1}=\frac{y-1}{2}=\frac{z-2}{3}$ Any arbitrary point on line is M(λ, 2λ+1, 3λ+2) Dr's of AM are < λ-1, 2 λ-5, 3λ-1> AM perpendicular to line 1 λ =1 ∴M(1, 3, 5) is the foot of perpendicular of the point A to the given line. Let the image of point A in the line be A'(α, β, γ) Since M is the mid point of AA', $M\left(\frac{1+\alpha}{2},\frac{6+\beta}{2},\frac{3+\gamma}{2}\right)=M(1,3,5)$ A'(1, 0, 7) Also, Equation of AA' is $\frac{x-1}{0}=\frac{y-6}{-6}=\frac{z-3}{4}$ **OR** line $\frac{x+5}{1}=\frac{y+3}{4}=\frac{z-6}{-9}$, any random point on the line will be given by P(λ-5, 4λ-3, -9λ+6) Since PQ=7 $\sqrt{(\lambda-7)^2+(4\lambda-7)^2+(-9\lambda+7)^2}=7$ $\lambda=1$ P(-4, 1, -3) The Equation of line PQ is $\frac{x+4}{6}=\frac{y-1}{3}=\frac{z+3}{2}$ *or* $\frac{x-2}{6}=\frac{y-4}{3}=\frac{z+1}{2}$	1 1 1 1 1 1 1 1 1 1
	CASE STUDY	
36	(i) No. of possible relation from S to J=$2^{12}=4096$ (n(S×J)=12) (ii) Condition: $\|S\|\le\|J\|$ $(hear, 4>3)$ It is impossible to assign all speakers to distinct judges. one-one functions can be there from set S to set J=0 (iii) Given function from S to J as $f=\{(S_1,J_1),(S_2,J_2),(S_3,J_2),(S_4,J_3)\}$ S_2 and S_3 are both assigned to J_2→ not injective All judges $J=\{J_1,J_2,J_3\}$ are assigned→Surjective Since f is not bijective **OR** relation $R_1=\{(S_1,S_2),(S_2,S_4)\}$ Add reflexive relation pairs $(S_1,S_1),(S_2,S_2),(S_3,S_3),(S_4,S_4)$ Keep (S_1,S_2) but excluded (S_2,S_1), Final relation $R_1=\{(S_1,S_1),(S_2,S_2),(S_3,S_3),(S_4,S_4),(S_1,S_2),(S_2,S_4)\}$	1 1 1 1 2

37	(i) Capacity=area×depth $=x^2h=250$ $Cost\ (C)=500x^2+4000h^2$ $C=500\left(\frac{250}{h}\right)+4000h^2$	1
	(ii) $\frac{dC}{dh}=-\frac{125000}{h^2}+8000h$ $\frac{dC}{dh}=0,\ h=\frac{5}{2}m$ or 2.5 m	1
	(iii) $\left(\frac{d^2C}{dh^2}\right)_{h=2.5}>0$ Cost is minimum when h=2.5 m Minimum cost $=C=\frac{125000}{\frac{5}{2}}+4000\left(\frac{5}{2}\right)^2$=Rs 75,000 **OR** h=2.5 m when $\frac{dC}{dh}=0$ For value of h less than 5/2 and closed o 5/2, $\frac{dC}{dh}<0$ For value of h less more than 5/2 and closed o 5/2, $\frac{dC}{dh}>0$ By first derivative test , C is minimum at h=5/2 Now $x^2=\frac{250}{h},\quad x=10\ m,\qquad also, x=4h$	1 1 1 1
38	Let E_1=customer avails loan on fixed rate E_2=customer avails loan on floating rate E_3=customer avails loan on variable rate A= Person defaults on the loan $P(\mathrm{E}_1)=\frac{1}{10},\ P(\mathrm{E}_2)=\frac{2}{10},\ P(\mathrm{E}_3)=\frac{7}{10},$ $P(\mathrm{A}/\mathrm{E}_1)=\frac{15}{100},\quad P(\mathrm{A}/\mathrm{E}_2)=\frac{3}{100},\ P(A/\mathrm{E}_3)=\frac{1}{100},$ (i) $P(A)=P(\mathrm{E}_1)P(\mathrm{A}/\mathrm{E}_1)+P(\mathrm{E}_2)P(\mathrm{A}/\mathrm{E}_2)+P(\mathrm{E}_3)P(A/\mathrm{E}_3)=9/500$ (ii) $P\left(\frac{E_3}{A}\right)=\frac{P(\mathrm{E}_3)P(\mathrm{A}/\mathrm{E}_3)}{P(\mathrm{E}_1)P(\mathrm{A}/\mathrm{E}_1)+P(\mathrm{E}_2)P(\mathrm{A}/\mathrm{E}_2)+P(\mathrm{E}_3)P(A/\mathrm{E}_3)}=7/18$	1+1 1+1