MARKING SCHEME SET 1 Code: KVS(DR)/2025/GP

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Pre-Board-I Examination-2025-26

Class- XII **Subject: Mathematics (041)**

Time: 3 Hours **Maximum Marks: 80**

SECTION: A (Solution of MCQs of 1 Mark each)

Q.N.	ANS/HINT/SOLUTION WITH EXPECTED STEPS
1.	B
1.	A
1.	C
1.	B
1.	C
1.	B
1.	C
1.	A
1.	C
1.	D
1.	C
1.	D
1.	A
1.	A
1.	D
1.	A
1.	B
1.	C
1.	C
1.	D
1.	Three points (or position vectors) are collinear if the vectors between them are pr (k,-10,3), B=(1,-1,3), C=(3,5,3). Consider vectors AB and AC: AB = B - A = (1-k, 9, 0) AC = C - A = (3-k, 15, 0) For AB and AC to be collinear, AB = λ AC for some scalar λ. Compare components: Since z-components are 0, they match. From y-component: 9 = λ·15 => λ = 9/15 = : From x-component: 1 - k = λ(3 - k) = (3/5)(3 - k) So 1 - k = (9/5) - (3k/5) Multiply by 5: 5 - 5k = 9 - 3k => bring terms: -5k +3k = 9 -5 => -2k =4 => k = -2. Answer: k = -2. **OR** Compute sum S = (2+λ)i + (4+2)j + (-5+3)k = (2+λ,6,-2).

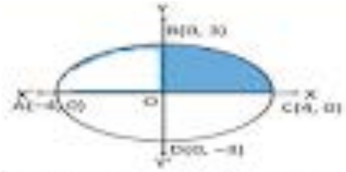
<table>
<tr><td></td><td>Unit vector along S = S/|S|.
Dot product with (1,1,1) gives ((2+λ)+6+(-2)) / |S| = (λ+6)/|S| = 1.
So |S| = λ+6.
Square both sides: (2+λ)^2 + 6^2 + (-2)^2 = (λ+6)^2.
=> λ=1</td></tr>
<tr><td>1.</td><td>dy/dx = -cot $\theta/2$
y_2 =1/4 $\text{cosec}^4\ \theta/2$
at $\frac{\theta}{2}$, $y_2 = 4$</td></tr>
<tr><td>1.</td><td>(i) One–one (injective): correct proof of one one .
(ii) Onto (surjective) : f is not onto as codomain not equal to range
OR
(i) Reflexive?
Here (1,1),(2,2),(3,3)∈R So R is reflexive.
(ii) Symmetric? We have (1,2)∈R but (2,1)∉R Therefore R is not symme
(iii) Transitive? (1,2)∈R and (2,3)∈R but (1,3)∉R. Hence R is not transiti

Conclusion: R is reflexive but neither symmetric nor transitive.</td></tr>
<tr><td>1.</td><td>LHL = -1 at x = 0
RHL = 1 at x = 0
Therefore f(x) is discontinuous at x = 0</td></tr>
<tr><td>1.</td><td>Correct fig and shaded region of required area
Area = 2 square unit</td></tr>
<tr><td>1.</td><td>S = {(H,H), (H,T), (T,1), (T,2), (T,3), (T,4), (T,5), (T,6)}
the probabilities assigned to the 8 elementary events
Probability of each Event
Correct answer
OR
The probability of speaking the truth is given as P(T)=3/5
The probability of lying is $P(L)=1-P(T)=1-3/5=2/5$

The probability of reporting a number greater than

P(R)=P(R|A)⋅P(A)+P(R|A′)⋅P(A′)
P(R)=(3/5)⋅(1/3)+(2/5)⋅(2/3)=3/15+4/15=7/15

P(A|R)=(3/5)⋅(1/3) / (7/15) = (3/ 15) / (7/15)
P(A|R)=3/7</td></tr>
<tr><td>1.</td><td>CORRECT FIG
Corner points (2,0) (8,0) (4,12) (2,13)
Max z = 200 at (4,12)</td></tr>
<tr><td>1.</td><td>Dr's of first line = <3,-16,7>
Dr's of second line = <3,8,-5>
Dr's of required line = <2,3,6>
Required equation of line is
$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z+4}{6}$</td></tr>
<tr><td>1.</td><td>Correct fig.</td></tr>
</table>



Equation of ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$

$y = \pm\frac{3}{4}\sqrt{16 - x^2}$

Area of Ellipse= $4\int_0^4 y dx = 4\int_0^4 \frac{3}{4}\sqrt{16 - x^2}dx$

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

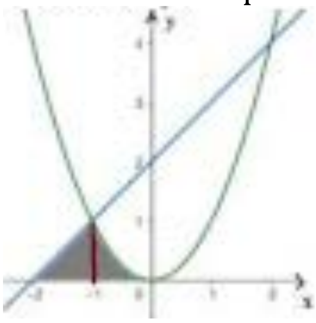
$= 3\left[\frac{x}{2}\sqrt{16 - x^2} + \frac{16}{2}\frac{x}{4}\right]_0^4$

$= 3\times\frac{8\pi}{2}$

$= 12\pi$ square units

OR

x coordinates of point of intersection are (– 1, 2)



Required area= $\int_{-2}^{-1} y_1 dx + \int_{-1}^{0} y_2 dx$

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

$= \left[\frac{x^2}{2} + 2x\right]_{-2}^{-1} + \left[\frac{x^3}{3}\right]_{-1}^{0}$

$= \left(-\frac{3}{2} - (-2)\right) + \left(0 - (-\frac{1}{3})\right)$

$= \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$ square units

1. F'(x) = $6(x^2+3x+2)$
Critical point : x=-1,-2
F(x) is decreasing function in interval (-2,-1)

OR

F'(x) = 4-x
Critical point : x=4
F(-2)= -10, f(4) = 8, f(9/2) = 63/8

Absolute max value = 8, absolute min value = -10

1. $y = \sin(m\sin^{-1}x) \quad \Rightarrow \frac{dy}{dx} = \cos(m\sin^{-1}x).\frac{m}{\sqrt{1-x^2}}$

$\Rightarrow \sqrt{1-x^2}\,\frac{dy}{dx} = m\cos(m\sin^{-1}x)$

Again diff.w.r.t.x, $\sqrt{1-x^2}\,\frac{d^2y}{dx^2} + \frac{dy}{dx}\left(\frac{-2x}{\sqrt{1-x^2}}\right) = -m\sin(m\sin^{-1}x).\frac{m}{\sqrt{1-x^2}}$

$\Rightarrow (1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = -m^2\sin(m\sin^{-1}x) = -m^2y$

$\Rightarrow (1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + m^2y = 0$

OR

. $y = (\log_e x)^x + x^{\log_e x} = e^{\log\{(\log_e x)^x\}} + e^{\log\{x^{\log_e x}\}}$

$= e^{x\log\{(\log_e x)\}} + e^{\log_e x.\log_e x}$

$\frac{dy}{dx}. = e^{x\log\{(\log_e x)\}}\left[x.\frac{1}{\log x}.\frac{1}{x} + \log(\log x).1\right] + e^{\log_e x.\log_e x}\left[\frac{\log x}{x} + \frac{\log x}{x}\right]$

$= (\log_e x)^x\left[\frac{1}{\log x} + \log(\log x)\right] + x^{\log_e x}\left[2\frac{\log x}{x}\right]$

1. $BA = [1 \ -1 \ 0 \ 2 \ 3 \ 4 \ 0 \ 1 \ 2][2 \ 2 \ -4 \ -4 \ 2 \ -4 \ 2 \ -1 \ 5] = [6 \ 0 \ 0 \ 0 \ 6 \ 0 \ 0 \ 0 \ 6] = 6[1 \ 0$

$B\left(\frac{1}{6}A\right) = I \qquad \Rightarrow \quad B^{-1} = \frac{1}{6}A = \frac{1}{6}[2 \ 2 \ -4 \ -4 \ 2 \ -4 \ 2 \ -1 \ 5$

The given equations can be re-written as, x – y = 3, 2x + 3y + 4z = 17, and y

$\therefore BX = C \ i.e. \ [1 \ -1 \ 0 \ 2 \ 3 \ 4 \ 0 \ 1 \ 2][x \ y \ z] = [3 \ 17 \ 7]$

$\Rightarrow X = B^{-1}C \ i.e. \ [x \ y \ z] = \frac{1}{6}[2 \ 2 \ -4 \ -4 \ 2 \ -4 \ 2 \ -1 \ 5][3 \ 17 \ 7] = \frac{1}{6}[12 \ -6 \ 2$

Hence, $x = 2, \ y = -1 \ and \ z = 4$

1. Let $y = \sin\varphi$ Then $dy = \cos\varphi \, d\varphi$

	Therefore, $\int \frac{(3\sin\phi - 2)\cos\phi}{5 - \cos^2\phi - 4\sin\phi} d\phi = \int \frac{(3y-2)\,dy}{5-(1-y^2)-4y}$ $= \int \frac{3y-2}{y^2-4y+4} dy$ $= \int \frac{3y-2}{(y-2)^2} = \text{I (say)}$ Now, we write $\frac{3y-2}{(y-2)^2} = \frac{A}{y-2} + \frac{B}{(y-2)^2}$ Therefore, $3y - 2 = A(y-2) + B$ Comparing the coefficients of y and constant term, we get A = 3 and B – 2A = – 2, which gives A = 3 and B = 4.Therefore, the required integral is given by $I = \int [\frac{3}{y-2} + \frac{4}{(y-2)^2}] dy = 3\int \frac{dy}{y-2} + 4\int \frac{dy}{(y-2)^2}$ $= 3\log\lvert y-2\rvert + 4\left(-\frac{1}{y-2}\right) + C$ $= 3\log\lvert \sin\phi - 2\rvert + \frac{4}{2-\sin\phi} + C$ $= 3\log(2-\sin\phi) + \frac{4}{2-\sin\phi} + C$ (since, $2 - \sin\phi$ is always positive) **OR** $\int \sqrt{(x+1)^2 + 2^2}dx = \int \sqrt{(t)^2 + 2^2}dt$ $\int \sqrt{(t^2 + 2^2}dt = \frac{t}{2}\sqrt{t^2 + 2^2} + \frac{2^2}{2} log\lvert t + \sqrt{t^2 + 2^2} + C$ $put\ t = x + 1,\ we\ get$ $\int \sqrt{((x+1)^2 + 2^2}dx = \frac{x+1}{2}\sqrt{(x+1)^2 + 2^2} + \frac{2^2}{2} log\lvert x + 1 + \sqrt{(x+1)^2 + 2^2} + C$ $\int \sqrt{x^2 + 2x + 5}\,dx = \frac{x+1}{2}\sqrt{(x+1)^2 + 2^2} + \frac{2^2}{2} log\lvert x + 1 + \sqrt{x^2 + 2x + 5} + C$
1.	The given differential equation is the Linear differential equation of the type $\frac{dy}{dx}$ + Here P = cotx and Q = 2x + x^2cotx Integrating factor (I.F.) = $e^{\int P\,dx} = e^{\int cotx dx} = e^{loglog\ sinx}$ = sinx So the general solution of the given equation is

	ysinx = $\int(2x + x^2 cotx)sinx\,dx$ ⇒ ysinx = $\int 2xsinx\,dx$ + $\int(x^2 cosx)dx$ ⇒ ysinx = sinx ($\frac{2x^2}{2}$) $- \int(cos\,x)\frac{2x^2}{2}\,dx$ + $\int(x^2 cosx)dx$ ⇒ ysinx = $x^2 sinx$ + c Now for the particular solution put y = 0 and x = $\frac{\pi}{2}$ So 0 = $(\frac{\pi}{2})^2$ sin $\frac{\pi}{2}$ + c ⇒ c = $-\frac{\pi^2}{4}$ Therefore the particular solution of given differential equation is ysinx = $x^2 sinx - \frac{\pi^2}{4}$ **OR** write the given equation as $\frac{dy}{dx} = \frac{x^2+y^2}{2xy}$ Since it is Homogeneous differential equation Put y = vx ⇒ $\frac{dy}{dx}$ = v + x $\frac{dv}{dx}$ in the given equation So , v + x $\frac{dv}{dx} = \frac{1+v^2}{2v}$ ⇒ x $\frac{dv}{dx} = \frac{1+v^2}{2v} -$ v ⇒ x $\frac{dv}{dx} = \frac{-(v^2-1)}{2v}$ Separating the variables and writing the equation as $\frac{2v}{v^2-1}dv = -\frac{dx}{x}$ Integrating both sides and getting $\int\frac{2v}{v^2-1}dv = -\int\frac{dx}{x}$ ⇒ log $\lvert(v^2-1)\rvert = -$log $\lvert x\rvert$ + log $\lvert c\rvert$ ⇒ log $\lvert x(v^2-1)\rvert$ = log c ⇒ $x(v^2-1)$ = ± c = c_1 Now replace v by $\frac{y}{x}$ to get $x^2 - y^2 = cx$
1.	**Sol.** Given lines are $\vec{r} = (3\hat{i}+5\hat{j}+7\hat{k}) + \lambda(\hat{i}-2\hat{j}+\hat{k})$, and $\vec{r} = (-\hat{i}-\hat{j}-\hat{k}) + \mu(7\hat{i}-6\hat{j}+\hat{k})$ $\vec{r} = (-\hat{i}-\hat{j}-\hat{k}) + \mu(7\hat{i}-6\hat{j}+\hat{k})$ $\vec{a}_1 = 3\hat{i}+5\hat{j}+7\hat{k}$, $\vec{b}_1 = \hat{i}-2\hat{j}+\hat{k}$;

	$\vec{a}_2 = -\hat{i} - \hat{j} - \hat{k}, \quad \vec{b}_2 = 7\hat{i} - 6\hat{j} + \hat{k}$ $\vec{a}_2 - \vec{a}_1 = -4\hat{i} - 6\hat{j} - 8\hat{k}, \quad \vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -2 & 1 \\ 7 & -6 & 1 \end{vmatrix} = 4\hat{i} + 6\hat{j} + 8\hat{k}$ $S.D. = \frac{\lvert(\vec{a}_2 - \vec{a}_1).(\vec{b}_1 \times \vec{b}_2)\rvert}{\lvert\vec{b}_1 \times \vec{b}_2\rvert} = \frac{\lvert(-4\hat{i} - 6\hat{j} - 8\hat{k}).(4\hat{i} + 6\hat{j} + 8\hat{k})\rvert}{\lvert 4\hat{i} + 6\hat{j} + 8\hat{k}\rvert}$ $= \frac{\lvert -16 - 36 - 64\rvert}{\sqrt{16+36+64}} = \frac{116}{\sqrt{116}} = \sqrt{116} = 2\sqrt{29}$
1.	(i) Not symmetric (ii) Not reflexive (iii) Not equivalence OR 2^{12}
1.	(i) P= 2 [x+ $\sqrt{4a^2 - x^2}$] (ii) X = a $\sqrt{2}$ (iii) P is maximum as second derivative negative. OR A = 40 $\sqrt{2}$
1.	(i) This can happen in two mutually exclusive ways: ● Gun A hits AND Gun B misses: P(A and B') = P(A) * P(B') = 0.3 * 0.8 = 0.24. ● Gun A misses AND Gun B hits: P(A' and B) = P(A') * P(B) = 0.7 * 0.2 = 0.14. The total probability of exactly one hit is the sum of these two: P(exactly one hit) = P(A and B') + P(A' and B) = 0.24 + 0.14 = 0.38. (ii) P(B | exactly one hit) = 0.14 / 0.38 = 14/38 = 7/19.