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JEE (MAIN) 2026

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-2

DATE & DAY: 05th April 2026 & Sunday

PAPER-1

Duration: 3 Hrs.

Time: 03:00 PM – 06:00 PM

SUBJECT: MATHEMATICS

Selections in JEE (Advanced)/
IIT-JEE Since 2002

52979

Classroom: 35901 | Distance: 17078

Selections in JEE (Main)/
AIEEE Since 2009

262693

Classroom: 194471 | Distance: 68222

Selections in NEET (UG)/
AIPMT/AIIMS Since 2012

22733

Classroom: 15409 | Distance: 7324

Admission Open for 2026-27

Target: JEE (Advanced) | JEE (Main) | NEET (UG) | PCCP (Class V to X)

100% Scholarship on the basis of Class 10th, 12th
& JEE (Main) 2026 %ile / AIR

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PART : MATHEMATICS

1. If $S = \left\{ \theta : \theta \in [-\pi, \pi], \cos \theta \cos \frac{5\theta}{2} = \cos 7\theta \cos \frac{7\theta}{2} \right\}$, then $n(S)$ is equal to

- (1) 17 (2) 19 (3) 21 (4) 23

Ans. (2)

Sol. $\cos \theta \cos \frac{5\theta}{2} = \cos 7\theta \cos \frac{7\theta}{2}$
 $\cos \frac{7\theta}{2} + \cos \frac{3\theta}{2} = \cos \frac{21\theta}{2} + \cos \frac{7\theta}{2}$
 $\cos \frac{21\theta}{2} - \cos \frac{3\theta}{2} = 0$

$$-2\sin 6\theta \sin \frac{9\theta}{2} = 0$$

$$\sin 6\theta = 0$$

$$\theta = 0, \pm \frac{\pi}{6}, \pm \frac{2\pi}{6}, \dots, \pm \frac{5\pi}{6}, \pm \pi \text{ (13 solutions) } \sin \frac{9\theta}{2} = 0$$

$$\theta = \pm \frac{2\pi}{9}, \pm \frac{4\pi}{9}, \pm \frac{8\pi}{9} \text{ (6 more solutions)}$$

Total = 19 solutions

2. If Z_1 and Z_2 are roots of equation $Z^2 + 4Z - (1 + 12i) = 0$, where $Z \in$ complex number, then the value of $|Z_1|^2 + |Z_2|^2$ is

- (1) 34 (2) 37 (3) 42 (4) 45

Ans. (1)

Sol. $Z^2 + 4Z - (1 + 12i) = 0$

$$\Rightarrow Z = \frac{-4 \pm \sqrt{16 + 4(1 + 12i)}}{2}$$

$$\Rightarrow Z = -2 \pm \sqrt{5 + 12i}$$

$$\Rightarrow Z = -2 \pm (3 + 2i)$$

$$\Rightarrow Z = 1 + 2i, -5 - 2i$$

$$\therefore |Z_1|^2 + |Z_2|^2 = 5 + 29 = 34$$

3. Let $y(x)$ is the solution of differential equation $\sqrt{\tan x} dy = (\sec^3 x - y(\tan x)^{3/2}) dx$ and $y(\pi/4) = \frac{6\sqrt{2}}{5}$ then the value of $y(\pi/3)$ is

- (1) $\frac{8}{5} \cdot 3^{1/4}$ (2) $\frac{8}{3} \cdot 3^{1/4}$ (3) $\frac{8}{5} \cdot 5^{1/4}$ (4) $\frac{7}{5} \cdot 3^{1/4}$

Ans. (1)

Sol. $\frac{dy}{dx} + y \tan x = \frac{\sec^3 x}{\sqrt{\tan x}}$

$$IF = e^{\int \tan x dx} = \sec x$$

$$y \sec x = \int \frac{\sec^4 x}{\sqrt{\tan x}} dx$$

$$y \sec x = \int \frac{(1 + \tan^2 x)}{\sqrt{\tan x}} \sec^2 x dx$$

$$\tan x = t$$

$$y \sec x = 2\sqrt{\tan x} + \frac{2}{5}(\tan x)^{5/2} + c$$

$$y\left(\frac{\pi}{4}\right) = \frac{6\sqrt{2}}{5}$$

$$\frac{6\sqrt{2}}{5} \times \sqrt{2} = 2 + \frac{2}{5} + c \Rightarrow \frac{12}{5} = \frac{12}{5} + c$$

$$\Rightarrow c = 0$$

$$y(\pi/3) = \frac{8}{5} \cdot 3^{1/4}$$

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4. Consider a parabola $y^2 = 8x$. The directrix of parabola cuts x-axis at A and PQ is a focal chord of parabola. If slope of PA = $\frac{3}{5}$ and abscissa of P is greater than 1, then the area of ΔAQP is

- (1) 40 (2) $\frac{69}{2}$ (3) $\frac{80}{3}$ (4) 23

Ans. (3)

Sol. Let $P(2t^2, 4t) \Rightarrow Q\left(\frac{2}{t^2}, \frac{4}{t}\right)$

given $m_{PA} = \frac{4t}{2t^2+2} = \frac{3}{5}$

$20t = 6t^2 + 6$

$3t^2 - 10t + 3 = 0$

$t = 3, \frac{1}{3}$ but $t > 1$ (given)

$\Rightarrow P(18, 12), Q\left(\frac{2}{9}, \frac{4}{3}\right)$

$A = \frac{1}{2} \begin{vmatrix} 1 & -2 & 0 \\ 1 & 18 & 12 \\ 1 & \frac{2}{9} & \frac{4}{3} \end{vmatrix} = \frac{80}{3}$

5. In a cricket team A and B can be chosen as captain, probability of A is to be chosen as captain is 0.6, and that of B is 0.4, if A is chosen as a captain then probability of winning team is 0.8 and that of B is 0.7 then total probability of winning of team is ?

- (1) 0.76 (2) 0.67 (3) 0.78 (4) 0.87

Ans. (1)

Sol. $P(\text{Win}) = P(A \cap \text{Win}) + P(B \cap \text{Win}) = (.6)(.8) + (.4)(.7) = .76$

6. Let $A = \{2,3\}$ and $B = \{5,6\}$, then the number of relations from $A \times B$ to $A \times B$ are

- (1) 2^{12} (2) 2^{14} (3) 2^{16} (4) 2^{18}

Ans. (3)

Sol. $n(A \times B) = 2 \times 2 = 4$

Number of relations = $2^{4 \times 4} = 2^{16}$

7. A bag contains 5 red balls, 6 blue balls and 4 black balls (balls of same colour are considered to be distinct). The number of ways in which 8 balls can be selected if atleast two balls of each colour is there, is

- (1) 4250 (2) 3650 (3) 3200 (4) 4100

Ans. (4)

Sol. Red - 5 Blue - 6 Black - 4

Reqd. No. of ways

$= {}^5C_2 \times {}^6C_2 \times {}^4C_4 + {}^5C_2 \times {}^6C_3 \times {}^4C_3 + {}^5C_2 \times {}^6C_4 \times {}^4C_2$

$+ {}^5C_3 \times {}^6C_2 \times {}^4C_3 + {}^5C_3 \times {}^6C_3 \times {}^4C_2 + {}^5C_4 \times {}^6C_2 \times {}^4C_2$

$= 10 \times 15 \times 1 + 10 \times 20 \times 4 + 10 \times 15 \times 6 + 10 \times 15 \times 4 + 10 \times 20 \times 6 + 5 \times 15 \times 6$

$= 150 + 800 + 900 + 600 + 1200 + 450 = 4100$

8. Let $\vec{OP} = \vec{a}$, $\vec{OQ} = \vec{b}$. If R be a point on OP such that $5\vec{OR} = \vec{OP}$ and M be a point on OQ such that $5\vec{RM} = \vec{OQ}$, then \vec{PM} is equal to (where O is origin)

- (1) $\frac{4b-\vec{a}}{5}$ (2) $\frac{b-4\vec{a}}{5}$ (3) $\frac{5b-\vec{a}}{4}$ (4) $\frac{b-5\vec{a}}{4}$

Ans. (2)

Sol. $\vec{OR} = \frac{\vec{a}}{5}$; $5\vec{RM} = \vec{OQ}$

$\Rightarrow \vec{b} = 5(\vec{OM} - \vec{OR})$

$\Rightarrow \vec{b} = 5\left(\vec{OM} - \frac{\vec{a}}{5}\right)$

$\Rightarrow \vec{OM} = \frac{\vec{b}+\vec{a}}{5}$

$\vec{PM} = \vec{OM} - \vec{OP} = \frac{\vec{b}+\vec{a}}{5} - \vec{a} = \frac{1}{5}(\vec{b} - 4\vec{a})$

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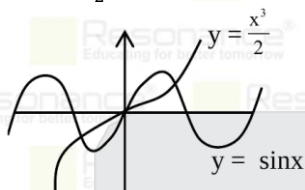
9. Let $f(x) = \lim_{y \rightarrow 0} \frac{(1 - \cos(xy)) \tan(xy)}{y^3}$ then the number of point of intersection of $f(x) = \sin x$ is

- (1) 1 (2) 2 (3) 3 (4) 4

Ans. (3)

Sol. $f(x) = \lim_{y \rightarrow 0} \frac{(1 - \cos(xy))}{(xy)^2} \times \frac{\tan(xy)}{xy} \times \frac{x^3}{1}$

$$f(x) = \frac{x^3}{2}$$



No. of point of intersection = 3

10. Let $A_1, A_2, A_3, \dots, A_{49}$ be 49 AM's between 49 and 149. Then the mean of A_1, A_{25}, A_{47} and A_{49} is

- (1) 110 (2) 120 (3) 130 (4) 140

Ans. (1)

Sol. $49, A_1, A_2, \dots, A_{49}, 149$ are in A.P.

Common difference

$$d = \frac{149 - 49}{50} = 2$$

$$\frac{A_1 + A_{25} + A_{47} + A_{49}}{4} = \frac{51 + 99 + 143 + 147}{4} = 110$$

11. If α, β are the roots of the equation $x^2 - 4x + p = 0$ and γ, δ are the roots of the equation $x^2 - x + q = 0$. When $\alpha, \beta, \gamma, \delta$ form a GP with positive common ratio. then the value of $(p + q)$ equals

- (1) $\frac{22}{9}$ (2) $\frac{33}{9}$ (3) $\frac{21}{9}$ (4) $\frac{34}{9}$

Ans. (4)

Sol. $\alpha = a, \beta = ar, \gamma = ar^2, \delta = ar^3$

$$a + ar = 4$$

$$ar^2 + ar^3 = 1$$

$$r = \frac{1}{2}, a = \frac{8}{3}$$

$$p + q = a^2 r + a^2 r^5$$

$$= \frac{34}{9}$$

12. If $3^a + 3^{-a}, f(a)$ and $2^{1+a} + 2^{1-a}$ are in A.P. If α is the minimum value of $f(x)$, then the value of

$$\int_{\ell \ln \alpha}^{\ell \ln \alpha} \frac{dx}{e^{2x} - e^{-2x}}$$

- (1) $\frac{1}{2} \ln \left(\frac{4}{3}\right)$ (2) $\frac{1}{4} \ln \left(\frac{4}{3}\right)$ (3) $\frac{1}{2} \ln \frac{8}{9}$ (4) $\frac{1}{4} \ln \frac{8}{9}$

Ans. (1)

Sol. $f(a) = \frac{3^a + 3^{-a} + 2^{1+a} + 2^{1-a}}{2}$

$$\Rightarrow f(a) = \frac{3^a + \frac{1}{3^a} + 2(2^a + \frac{1}{2^a})}{2}$$

$$\therefore f(a)_{\min} = 3 \text{ at } a = 0$$

$$\therefore \alpha = 3$$

$$I = \int_{\ln 2}^{\ln 3} \frac{dx}{e^{2x} - e^{-2x}} \Rightarrow I = \int_{\ln 2}^{\ln 3} \frac{e^{2x} dx}{(e^{2x})^2 - 1}$$

$$e^{2x} = t$$

$$\Rightarrow I = \frac{1}{2} \int_4^9 \frac{dt}{t^2 - 1} \Rightarrow I = \frac{1}{2} \left[\ell n \left| \frac{t-1}{t+1} \right| \right]_4^9$$

$$I = \frac{1}{2} \left(\ln \frac{4}{5} - \ln \frac{3}{5} \right) \Rightarrow I = \frac{1}{2} \left(\ln \frac{4}{3} \right)$$

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13. The coefficient of x^2 in the binomial expansion of $(2x^2 + \frac{1}{x})^{10}$ is

- (1) 3360 (2) 2360 (3) 3260 (4) 3380

Ans. (1)

Sol. $T_{r+1} = {}^{10}C_r (2x^2)^{10-r} (1/x)^r$
 $= {}^{10}C_r 2^{10-r} x^{20-2r-r}$
 $= {}^{10}C_r 2^{10-r} x^{20-3r}$
 $\Rightarrow 20 - 3r = 2$
 $r = 6$

So required coefficient is ${}^{10}C_6 2^4$

14. Let foci of a hyperbola are (3,5) and (3,-4). If eccentricity 'e' of the hyperbola satisfies the equation $3e^2 - 11e + 6 = 0$, then the length of the latus rectum of the hyperbola is

- (1) 20 (2) 24 (3) 18 (4) 26

Ans. (2)

Sol. $S_1(3,5)$ & $S_2(3,-4)$

$\therefore S_1 S_2 = 2ae$

$\Rightarrow 9 = 2ae$

and $\therefore 3e^2 - 11e + 6 = 0$

$\Rightarrow e = 3, e = \frac{2}{3} < 1$ (rejected)

From (1) $a = \frac{3}{2}$

$\Rightarrow LR = 2 \cdot \frac{b^2}{a} = 2a(e^2 - 1) = 3[9 - 1] = 24$

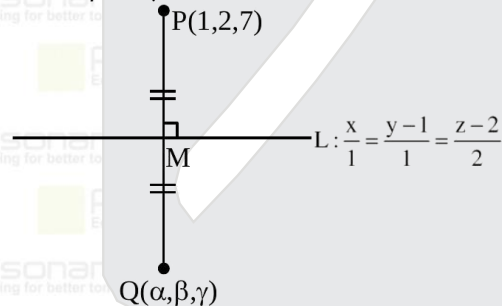
15. If distance of point (a,2,5) from image of point (1,2,7) in the line $\frac{x}{1} = \frac{y-1}{1} = \frac{z-2}{2}$ is 4, then sum of all possible values of a is

- (1) 4 (2) 5 (3) 6 (4) 8

Ans. (3)

Sol. $PQ \perp L \Rightarrow (\alpha - 1) + (\beta - 2) + 2(\gamma - 7) = 0$

$\Rightarrow \alpha + \beta + 2\gamma = 17$



M is mid point of PQ which will satisfy L

$\frac{\alpha+1}{2} = \frac{\beta+2-1}{2} = \frac{\gamma+7-2}{2}$

$\Rightarrow \frac{\alpha+1}{2} = \frac{\beta}{2} = \frac{\gamma+3}{4}$

$\Rightarrow \alpha + 1 = \beta$

and $2\beta = \gamma + 3$

$\Rightarrow \alpha = 3, \beta = 4, \gamma = 5$

Distance from (a, 2, 5) is $\sqrt{(a-3)^2 + 4 + 0} = 4 \Rightarrow (a-3)^2 + 4 = 16 \Rightarrow a^2 - 6a - 3 = 0 \Rightarrow$ sum of values of a = 6

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16. Let $f(x) + 3f\left(\frac{\pi}{2} - x\right) = \sin x$ & maximum value of f is α . If area bounded between $g(x) = x^2$ & $h(x) = \beta x^3$ ($\beta > 0$) is α^2 , then $30\beta^3$ is equal to
 (1) 14 (2) 16 (3) 20 (4) 22

Ans. (2)

Sol. $f(x) + 3f\left(\frac{\pi}{2} - x\right) = \sin x$

Put $x \rightarrow \frac{\pi}{2} - x$

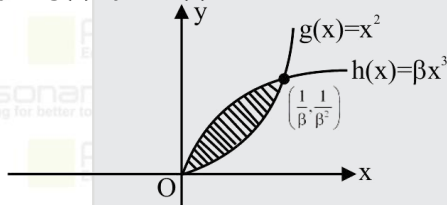
$\therefore f\left(\frac{\pi}{2} - x\right) + 3f(x) = \cos x$

From (1) & (2)

$f(x) = \frac{1}{8}(3\cos x - \sin x)$

$f_{\max} = \frac{\sqrt{10}}{8}$

$y = g(x)$ & $y = h(x)$ intersect as shown in the figure



\therefore Area bounded = $\Delta = \left| \int_0^{\frac{1}{\beta}} (\beta x^3 - x^2) dx \right|$

$= \frac{1}{12\beta^3} = \alpha^2$ (given)

$\Rightarrow 30\beta^3 = 16$

17. If the sum of the first 10 terms of the series $\frac{1}{1+4 \times 1^4} + \frac{2}{1+4 \times 2^4} + \frac{3}{1+4 \times 3^4} + \dots$ is $\frac{m}{n}$ (where m, n are coprime), then $(m + n)$ is

(1) 264

(2) 276

(3) 284

(4) 256

Ans. (2)

Sol. $T_r = \frac{r}{1+4r^4} = \frac{r}{4r^4+4r^2+1-4r^2} = \frac{r}{(2r^2+1)^2 - (2r)^2}$

$= \frac{r}{(2r^2+2r+1)(2r^2-2r+1)}$

$S_{10} = \frac{1}{4} \left(\frac{1}{1} - \frac{1}{221} \right) = \frac{55}{221} = \frac{m}{n}$

$\therefore m + n = 276$

18. If $f(x)$ satisfy the equation $f(x) = \int_1^x f(t) dt + (1-x)(\log_e x - 1) + e$ then $f(f(1))$ is equal to

(1) $1 - e^{2-e}$

(2) $1 + e^{2+e}$

(3) $1 + e^e$

(4) $1 - e^{2+e}$

Ans. (3)

Sol. $f(x) = \int_1^x f(t) dt + (1-x)(\log_e x - 1) + e$

$f'(x) = f(x) - (\log_e x - 1) + \frac{(1-x)dy}{x} - y = \frac{1}{x} - \log_e x$

IF = e^{-x}

solution is $ye^{-x} = \int e^{-x} \left(\frac{1}{x} - \log_e x \right) dx$

$ye^{-x} = \int \left(\frac{e^{-x}}{x} \right) dx - \int e^{-x} \log_e x dx$

$ye^{-x} = e^{-x} \log_e x + c$

$f(x) = y = \log_e x + ce^x$

$f(1) = e = ce \Rightarrow c = 1$

$f(x) = \log_e x + e^x$

$f(1) = e$

$f(f(1)) = f(e) = 1 + e^e$

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19. A line $L: x + y = 0$ is given. Two lines L_1 & L_2 are passing through $(-1, -1)$ inclined at an angle of 45° from line L . Reflection of lines L_1 and L_2 in line $2y + x = 1$ is $ax + by = 9$ and $cx + dy = 1$ then the value of $|ad + bc|$ is equal to

(1) 1 (2) 2 (3) 3 (4) 4

Ans. (1)

Sol.

$$\tan 45^\circ = \left| \frac{m+1}{1-m} \right|$$

$$\Rightarrow \pm 1 = \frac{m+1}{1-m}$$

$\Rightarrow m = 0$ & one line is perpendicular to x axis.

$$L_1: x = -1, L_2: y = -1$$

Now taking mirror image of $x + 1 = 0$ in $x + 2y = 1$

$$A': \frac{x+1}{1} = \frac{y+1}{2} = \frac{-2(-1-2-1)}{1^2+2^2}$$

$$x = \frac{3}{5}, y = \frac{11}{5} \quad A' \left(\frac{3}{5}, \frac{11}{5} \right)$$

$$\text{line} = 3x - 4y + 7 = 0$$

Now taking mirror image of $y + 1 = 0$ in $x + 2y = 1$

$$A'': \frac{x+1}{1} = \frac{y+1}{2} = \frac{-2(-1-2-1)}{1^2+2^2}$$

$$x = \frac{3}{5}, y = \frac{11}{5}$$

$$A'' \left(\frac{3}{5}, \frac{11}{5} \right)$$

$$\text{line} : (y + 1) = \frac{\left(\frac{11}{5} + 1\right)}{\left(\frac{3}{5} - 3\right)} (x - 3)$$

$$4x + 3y = 9$$

comparing $4x + 3y = 9$ with $ax + by = 9$ &

$$3x - 4y = -7 \text{ with } cx + dy = 1$$

$$a = 4 \quad b = 3 \quad c = \frac{-3}{7} \quad d = \frac{4}{7}$$

$$|ad + bc| = \left| 4 \times \left(\frac{4}{7}\right) + (3) \left(\frac{-3}{7}\right) \right| = 1$$

20. $A = \{1, 4, 7\}$, $B = \{2, 3, 8\}$ let R be a relation defined as $\{(a_1, b_1), (a_2, b_2)\} \in (A \times B) \times (A \times B) : (a_2 + b_1) \mid (a_1 + b_2)\}$ then find number of relations.

(18)

Ans.

Sol.

| A/B | 2 | 3 | 8 |
|-----|---|----|----|
| 1 | 3 | 4 | 9 |
| 4 | 6 | 7 | 12 |
| 7 | 9 | 10 | 15 |

These are possible sum of $a_i + b_j$.

Now $b_1 + a_2$ divides $a_1 + b_2$

So,

| $a_1 + b_2$ | $a_2 + b_1$ | No. of pairs |
|-------------|-------------|--------------|
| 15 | 3, 15 | 2 |
| 12 | 3, 4, 6, 12 | 4 |
| 10 | 10 | 1 |
| 9 | 3, 9 | 6 |

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| | | |
|---|-----|----|
| 7 | 7 | 1 |
| 6 | 3,6 | 2 |
| 4 | 4 | 1 |
| 3 | 3 | 1 |
| | | 18 |

Number of relations = 18

21. Let $f(n) = \begin{vmatrix} n & -1 & -5 \\ -2n^2 & 3(2k+1) & 2k+1 \\ -3n^3 & 3k(2k+1) & 3k(k+2)+1 \end{vmatrix}$

If $\sum_{n=1}^k f(n) = 98$ then find k .

Ans. (3)

Sol. $f(n) = \begin{vmatrix} n & -1 & -5 \\ -2n^2 & 3(2k+1) & 2k+1 \\ -3n^3 & 3k(2k+1) & 3k(k+2)+1 \end{vmatrix}$

$$\sum_{n=1}^k f(n) = \begin{vmatrix} \frac{k(k+1)}{2} & -1 & -5 \\ -2 \frac{k(k+1)(2k+1)}{6} & 3(2k+1) & 2k+1 \\ -3 \frac{k^2(k+1)^2}{4} & 3k(2k+1) & 3k(k+2)+1 \end{vmatrix} = 98$$

$$\Rightarrow \frac{k(k+1)(2k+1)}{2} \cdot \frac{7}{3} = 98$$

$$\Rightarrow k(k+1)(2k+1) = 84$$

$$\Rightarrow k = 3$$

22. A 3rd order square matrix M satisfy

$$M \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}; M \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} \& M \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \\ 2 \end{pmatrix}.$$

If $M \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \\ 7 \end{pmatrix}$, then $x + y + z$ is

Ans. (3)

Sol. Let $M = \begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$

$$M \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} \Rightarrow a_1 = 1, b_1 = 2, c_1 = 3$$

Similarly $a_2 = 0, b_2 = 1, c_2 = 2$

& $a_3 = -1, b_3 = 1, c_3 = 2$

$$M \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2 \\ 4 \\ 7 \end{pmatrix}$$

$$\Rightarrow x + 0y - z = 2$$

$$2x + y + z = 4$$

$$3x + 2y + 2z = 7$$

$$\Rightarrow D = -1, D_1 = -1, D_2 = -3, D_3 = 1$$

$$x = 1, y = 3, z = -1$$

$$x + y + z = 3$$

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