Model Question Paper
Mathematics
Class 10+2

Time Allowed : 3 hours Max. Marks 85

Special Instructions :-

(i) Write Question paper series in the circle at the top left side of title page of Answer Book.

(ii) While answering questions, indicate on the Answer-Book the same Question No. as appears in the question paper.

(iii) Try to answer the questions in serial order as far as possible.

(iv) All questions are compulsory.

(v) Internal choices have been provided in some questions. Attempt only one of the choices in such questions.

(vi) Question Nos. 1 to 10 are multiple choice questions of 1 mark each. Question no. 11 to 13 are of 3 marks each, 14 to 22 are of 4 marks each, 23 to 27 are of 6 marks each.

(vii) Use of calculator is not allowed.

Q1. $\cos^{-1}\left(\cos \frac{7\pi}{6}\right)$ is equal to

(a) $\frac{7\pi}{6}$ (b) $\frac{5\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$ (1)

Q2. The number of all possible matrices of order 3×3 with each entry 00N 1 is

(a) 27 (b) 18 (c) 81 (d) 512 (1)

Q3. The derivative of $\sin^{-1} x$ is

(a) $\frac{1}{\sqrt{1-x^2}}$ (b) $-\frac{1}{\sqrt{1-x^2}}$ (c) $\frac{1}{1-x^2}$ (d) $\frac{1}{1+x^2}$ (1)

Q4. The approximate change in volume V of a cube of side x metres caused by increasing the side by 2% is : (1)

(a) $0.06\ x^3m^3$ (b) $0.002\ x^3m^3$ (c) $0.6\ x^3m^3$ (d) $0.006\ x^3m^3$

Q5. $\int \sec x\, dx = ?$ (1)

(a) $\tan x + c$ (b) $\frac{\log}{\sec x} + \frac{\tan x}{+ c}$ (c) $\frac{\log}{\sec x} - \tan x$ (d) $\cot x + C$

Q6. The degree of the differential equation $\left(\frac{d^2y}{dx^3}\right)^3 + \left(\frac{dy}{dx}\right)^3 + 2y = 0$ is (1)

(a) 3 (b) 1 (c) 2 (d) Not defined

Q7. Let $\vec{a}$ and $\vec{b}$ be the two unit vectors and θ is the angle between them. Then $\vec{a}+\vec{b}$ is a unit vector if (1)

(A) $\theta = \frac{\pi}{4}$ (B) $\theta = \frac{\pi}{3}$ (C) $\theta = \frac{\pi}{2}$ (D) $\theta = \frac{2\pi}{3}$

Q8. $\vec{a} \cdot \vec{a} = ?$ (1)

(A) $\vec{a}^2$ (B) $|\vec{a}|^2$ (C) 0 (D) $|\overrightarrow{a^2}|$

Q9. Distance between two planes $2x+3y+4z = 4$ and $4x+6y+8z=12$ is (1)

(A) 2 units (B) 4 units (C) 8 units (D) $\frac{2}{\sqrt{29}}$ units

Q10. The probability of obtaining an even prime number on each die when a pair of dice is rolled is : (1)

(A) 0 (B) $\frac{1}{3}$ (C) $\frac{1}{12}$ (D) $\frac{1}{36}$

Q11. Find all points of discontinuity of f, where f is defined by (3)

$$f(x) = \begin{cases} \frac{1\times 1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

Q12. Find the intervals in which the function f, given by $f(x) = 2x^3 - 3x^2 - 36x + 7$ is strictly increasing. (3)

Q13. A die is tossed thrice. Find the probability of getting an odd number atleast once.(3)

Q14. Find gof and fog, if $f(x) = |x|$ and $g(x) = |5x - 2|$. (4)

Q15. Prove that : $\cos^{-1}\frac{4}{5} + \cos^{-1}\frac{12}{13} = \cos^{-1}\frac{33}{65}$ (4)

Q16. Express the following matrix as sum of a symmetric and skew symmetric matrix.

$$\begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix}$$

OR

By using properties of determinants show that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$ (4)

Q17. Differentiate $\sin(\cos x^2)$ w.r.t. x (4)

Q18. Evaluate : $\int \sqrt{x^2+4x+1}\, dx$ (4)

OR

Evaluate : $\int \frac{3x-1}{(x+2)^2} dx$

Q19. Using properties of definite integral evaluate $\int_0^{\frac{\pi}{4}} \log(1+\tan x)\, dx$ (4)

Q20. Find the general solution of differential equation :

$x\frac{dy}{dx} + 2y = x^2 \; (x \neq 0)$ (4)

OR

Solve the differential equation :

$$(1+e^{\frac{x}{y}})\,dx + e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy = 0$$

Q21. Show that the four points A, B, C and D with position vectors $4\hat{i}+5\hat{j}+\hat{k}$, $-\hat{j}-\hat{k}$, $3\hat{i}+9\hat{j}+4\hat{k}$ and $-4\hat{i}+4\hat{j}+4\hat{k}$ respectively are coplanar. (4)

Q22. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as "number greater than 4". (4)

Q23. Solve the system of binear equations, using matrix method : (6)

$$2x+y+z = 1$$
$$x-2y-z = \frac{3}{2}$$
$$3y-5z = 9$$

Q24. Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (6)

OR

Using integration, find the area bounded by the curve $|x| + |y| = 1$

Q25. Find the shortest distance between the lines

$\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(\hat{i} - 3\hat{j} + 2\hat{k})$

and $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu(2\hat{i} + 3\hat{j} + \hat{k})$

OR

Find the angle between the line

$$\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$$

and the plane $10x + 2y - 11z = 3$ (6)

Q26. Find the absolute maximum value and absolute minimum value of the function.

$f(x) = x^3$ in the interval $[-2, 2]$

OR

Find the equations of tangent and normal to the curve (6)

$x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2$ at $(1, 1)$

Q27. Minimize $z = -3x + 4y$ subject to

$x + 2y \leqslant 8$

$3x + 2y \leqslant 12$

$x, y \geqslant 0$ graphically. (6)

Distribution of Marks

Unit I (9 marks)

1. Relations and functions. 4
2. Inverse trigonometric function 1+4=5

Unit II (11 marks)

Matrices and determinants 1+4© + 6 = 11

Unit III (38 marks)

1. Continuity and differentiability 1+3+4=8
2. Applications of Derivatives 1+3+6 © = 10
3. Integrals 1+4© +4=9
4. Application of integrals 6© = 6
5. Differential equations 1+4© = 5

Unit IV (13 marks)

1. Vectors 1+1+4 = 6
2. 3-D Geometry 1+6© = 7

Unit V (6 marks) Linear Programming 6

Unit VI (8 marks) Probability 1+3+4=8

Note : (1) Total No. of Questions = 27

(2) Q.No. 1 to 10 of 1 mark each, 11 to 13 are of 3 marks each, 14 to 22 are of 4 marks each, 23 to 27 are of 6 marks each.

Choice :

Q.No. 16,	18,	20,	24,	25,	26	
Marks 4,	4,	4,	6,	6,	6	= 30 marks

Solutions Set
Mathematics 10+2

Q1. $\text{Cos}^{-1}\left(\cos \frac{7\pi}{6}\right)$ is equal to

(a) $\frac{7\pi}{6}$ (b) $\frac{5\pi}{6}$ © $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

Solution 1 : Answer is $\frac{5\pi}{6}$ i.e. b (1)

Q2. The number of all possible matrices of order 3×3 with each entry 00N 1 is
(a) 27 (b) 18 (c) 81 (d) 512

Solution 2 : Answer is 512 i.e. d (1)

Q3. The derivative of $\sin^{-1} x$ is

(a) $\frac{1}{\sqrt{1-x^2}}$ (b) $-\frac{1}{\sqrt{1-x^2}}$ (c) $\frac{1}{1-x^2}$ (d) $\frac{1}{1+x^2}$

Solution 3: Answer is $\frac{1}{\sqrt{1-x^2}}$ i.e. a (1)

Q4. The approximate change in volume V of a cube of side x metres caused by increasing the side by 2% is :
(a) $0.06\ x^3m^3$ (b) $0.002\ x^3m^3$ (c) $0.6\ x^3m^3$ (d) $0.006\ x^3m^3$

Solution 4 : Answer is $0.06\ x^3m^3$ i.e. a (1)

Q5. $\int \sec x\, dx$ = ?
(a) tanx + c (b) $\frac{\log}{\sec x} + \frac{\tan x}{+ c}$ (c) $\frac{\log}{\sec x} - \tan x$ (d) cotx + C

Solution 5 : Answer is $\frac{\log}{\sec x} + \frac{\tan x}{+ c}$ i.e. b (1)

Q6. The degree of the differential equation $\left(\frac{d^2y}{dx^3}\right)^3 + \left(\frac{dy}{dx}\right)^3 + 2y = 0$ is

(a) 3 (b) 1 © 2 (d) Not defined (1)

Solution 6 : Answer is 3 i.e. a

Q7. Let $\vec{a}$ and $\vec{b}$ be the two unit vectors and θ is the angle between them. Then $\vec{a}+\vec{b}$ is a unit vector if

(A) $\theta=\frac{\pi}{4}$ (B) $\theta=\frac{\pi}{3}$ (C) $\theta=\frac{\pi}{2}$ (D) $\theta=\frac{2\pi}{3}$ (1)

Solution 7 : Answer is $\theta=\frac{2\pi}{3}$ i.e. D

Q8. $\vec{a} \cdot \vec{a} = ?$ (1)

(A) $\vec{a}^{\,2}$ (B) $|\vec{a}|^2$ (C) 0 (D) $|\vec{a^2}|$

Solution 8 : Answer is $|\vec{a}|^2$ i.e. B

Q9. Distance between two planes $2x + 3y + 4z = 4$ and $4x + 6y + 8z = 12$ (1)

(A) 2 units (B) 4 units (C) 8 units (D) $\frac{2}{\sqrt{29}}$ units

Solution 9 : Answer is $\frac{2}{\sqrt{29}}$ units i.e. D.

Q10. The probability of obtaining an even prime number on each die when a pair of dice is rolled is : (1)

(A) 0 (B) $\frac{1}{3}$ (c) $\frac{1}{12}$ (D) $\frac{1}{36}$

Solution 10 : Answer is $\frac{1}{36}$ i.e. D

Q11. Find all points of discontinuity of f, where f is defined by (3)

$$f(x) = \begin{cases} \frac{1\times 1}{x} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

Solution 11 : L.H.L. $= \underset{x\to 0^-}{lt} f(x) = \underset{x\to 0^-}{lt} \frac{(-x)}{x} = -1$

R.H.L. $= \underset{x\to 0^+}{lt} f(x) = \underset{x\to 0^+}{lt} \frac{x}{x} = 1$

L.H.L. $\neq$ R.H.L.

$\therefore$ f is discontinuous at $x = 0$

Q12. Find the intervals in which the function f, given by $f(x) = 2x^3 - 3x^2 - 36x + 7$ is strictly increasing. (3)

Solution 12 : Let $f'(x) = 0$

$\Rightarrow 6(x-3)(x+2) = 0$

$x = 3$ or -2

f is strictly increasing in $(-\infty, -2) \cup (3, \infty)$

Q13. A die is tossed thrice. Find the probability of getting an odd number atleast once. (3)

Solution 13 : $P(A) = \frac{3}{6} = \frac{1}{2}$

Required probability = P (atleast an odd number)

$= 1 - P(\bar{A}\ \bar{A}\ \bar{A})$

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

$= \frac{7}{8}$

Q14. Find gof and fog, if $f(x) = |x|$ and $g(x) = |5x - 2|$. (4)

Solution 14 : $f(x) = |x|$, $g(x) = |5x-2|$

$(gof)(x) = g(f(x)) = g(|x|) = |5|x|-2|$

$(fog)(x) = f(g(x)) = f(|5x-2|) = ||5x-2||$

Q15. Prove that : $\cos^{-1}\frac{4}{5} + \cos^{-1}\frac{12}{13} = \cos^{-1}\frac{33}{65}$

Solution 15 : Let $\cos^{-1}\frac{4}{5} = x$ and $\cos^{-1}\frac{12}{13} = y$

We know that

$\cos(x+y) = \cos x \cos y - \sin x \sin y$

$= \frac{4}{5} \times \frac{12}{13} - \frac{3}{5} \times \frac{5}{13}$

$= \frac{33}{65}$

$x + y = \cos^{-1}\frac{33}{65}$

$\text{Cos}^{-1}\frac{4}{5} + \text{Cos}^{-1}\frac{12}{13} = \text{Cos}^{-1}\frac{33}{65}$

(3)

Q16. Express the following matrix as sum of a symmetric and skew symmetric matrix.

$$\begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix}$$

Solution 16 : $A = \begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix}$ and $A' = \begin{pmatrix} 3 & 1 \\ 5 & -1 \end{pmatrix}$

$$P = \tfrac{1}{2}(A + A')$$

$$= \tfrac{1}{2}\begin{pmatrix} 6 & 6 \\ 6 & -2 \end{pmatrix}$$

$$= \begin{pmatrix} 3 & 3 \\ 3 & -1 \end{pmatrix}$$

$\Rightarrow$ P' = P

$\Rightarrow$ P is symmetric matrix.

$$Q = \tfrac{1}{2}(A - A')$$

$$Q = \begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix}$$

$\Rightarrow Q' = -Q$

$$\Rightarrow P + Q = \begin{pmatrix} 3 & 3 \\ 3 & -1 \end{pmatrix} + \begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix} = \begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix} = A$$

A is sum of symmetric & skew symmetric Matrix.

OR

By using properties of determinants show that

$$\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

Solution16 :

$$\Delta = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$$

Operate $R_2 \to R_2 - R_1$

$R_3 \to R_3 - R_1$

$$\Delta = \begin{vmatrix} 1 & a & a^2 \\ 0 & b-a & b^2-a^2 \\ 0 & c-a & c^2-a^2 \end{vmatrix}$$

Taking common & expanding

$\Delta = (a-b)(b-c)(c-a)$ (4)

Q17. Differentiate sin (cosx²) w.r.t. x

Solution 17 : Let $y = \text{Sin}(\text{Cos}(x^2))$

$$\frac{dy}{dx} = \text{Cos}(\text{Cos}\,x^2)(-\text{Sin}x^2)\frac{d}{dx}x^2$$

$$= -2x\,\text{Sin}\,x^2\,\text{Cos}(\text{Cos}\,x^2)$$

Q18. Evaluate : $\int \sqrt{x^2+4x+1}\,dx$ (4)

Solution 18 : Let $I = \int \sqrt{x^2+4x+1}\,dx$

$= \int \sqrt{(x+2)^2-(\sqrt{3})^2}\,dx$ using formula $\int \sqrt{x^2-a^2}$

$$= \frac{(x+2)}{2}\sqrt{(x+2)^2-(\sqrt{3})^2} - \frac{3}{2}\log\left[(x+2)+\sqrt{(x+2)^2-(\sqrt{3})^2}\right]+C$$

$$= \frac{(x+2)}{2}\sqrt{x^2+4x+1} - \frac{3}{2}\log\left[(x+2)+\sqrt{x^2+4x+1}\right]+C$$

OR

Evaluate : $\int \frac{3x-1}{(x+2)^2}\,dx$

Solution 18 : Let $I = \int \frac{3x-1}{(x-2)^2}\,dx$

$$\frac{3x-1}{(x-2)^2} = \frac{A}{(x-2)} + \frac{B}{(x-2)^2}$$

$$I = \int \frac{3x-1}{(x-2)^2}\,dx = 3\int \frac{dx}{(x-2)} + 5\int \frac{dx}{(x-2)^2}$$

$$= 3\log(x-2) - 5\left(\frac{1}{(x-2)}\right) + C$$

Q19. Using properties of definite integral evaluate $\int_0^{\frac{\pi}{4}} \log(1+\tan x)\,dx$ (4)

Solution19 : Let $I = \int_0^{\frac{\pi}{4}} \log(1+\tan x)\,dx$

Using $\int_0^a f(x)\,dx = \int_0^a f(a-x)dx$

We get

$$I = \int_0^{\frac{\pi}{4}} \log\left(\frac{2}{1+\tan x}\right) dx$$

$$2I = \int_0^{\frac{\pi}{4}} \log 2\,dx$$

$$I = \frac{1}{2}\log 2\,[x]_0^{\frac{\pi}{4}}$$

$$I = \frac{\pi}{8}\log 2$$

Q20. Find the general solution of differential equation :

$x\frac{dy}{dx}+2y = x^2\ (x \neq 0)$

Solution 20 : Given differential equation is

$$x\frac{dy}{dx}+2y = x^2$$

$$\frac{dy}{dx}+\frac{2}{x}y = x$$

$$\text{I.F.} = e^{\log x^2} = x^2$$

$$y.x^2 = \int x^3\,dx + c$$

$$y = \frac{x^2}{4} + cx^{-2}$$

OR

Solve the differential equation :

$$(1+e^{\frac{x}{y}})\,dx + e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy = 0$$

OR

Solution : $\dfrac{dx}{dy} = \dfrac{e^{\frac{-x}{y}}\left(1-\frac{x}{y}\right)}{1+e^{\frac{x}{y}}}$

Put $x = vy \Rightarrow \dfrac{dx}{dy} = v + y\dfrac{dv}{dy}$

$$v + y\frac{dv}{dy} = \frac{-e^{v}(1-v)}{1+e^{v}}$$

$$y\frac{dv}{dy} = \frac{-(e^{v}+v)}{e^{v}+1}$$

Integrating we get

$$\log(e^{v}+v)\,y = \log c$$

$$-x + ye^{x/y} = c$$

Q21. Show that the four points A, B, C and D with position vectors $4\hat{i}+5\hat{j}+\hat{k}$, $-\hat{j}-\hat{k}$, $3\hat{i}+9\hat{j}+4\hat{k}$ and $-4\hat{i}+4\hat{j}+4\hat{k}$ respectively are coplanar. (4)

Solution 21 :

$$[AB \quad AC \quad AD] = \begin{vmatrix} -4 & -6 & -2 \\ -1 & 4 & 3 \\ -8 & -1 & 3 \end{vmatrix} = 0$$

Hence A, B, C and D are coplanar.

Q22. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as "number greater than 4".

Solution 22 : Sample space is {1, 2, 3, 4, 5, 6}

$P(\text{Success}) = \frac{1}{3}$

$x = 0, 1, 2$

$P(x=0) = P(\bar{S}\ \bar{S}) = \frac{4}{9}$

$P(x=1) = P(S\ \bar{S} \text{ or } \bar{S}\ S) = \frac{4}{9}$

$P(x=2) = P(SS) = \frac{1}{9}$

Probability distribution

x	0	1	2
P(x)	$\frac{4}{9}$	$\frac{4}{9}$	$\frac{1}{9}$

Q23. Solve the system of binear equations, using matrix method : (6)

$$2x + y + z = 1$$
$$x - 2y - z = \frac{3}{2}$$
$$3y - 5z = 9$$

Solution 23 : Let $Ax = B$

$(A) = 34 \neq 0$

$$\text{Adj}\,A = \begin{vmatrix} 13 & 8 & 1 \\ 5 & -10 & 3 \\ 3 & -6 & -5 \end{vmatrix}$$

$$A^{-1} = \frac{\text{Adj } A}{|A|} = \frac{1}{34} \begin{vmatrix} 13 & 8 & 1 \\ 5 & -10 & 3 \\ 3 & -6 & -5 \end{vmatrix}$$

$$X = \begin{bmatrix} 1 \\ \frac{1}{2} \\ \frac{-3}{2} \end{bmatrix} \Rightarrow x = 1, y = \frac{1}{2}, z = \frac{-3}{2}$$

Q24. Find the area enclosed by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (6)

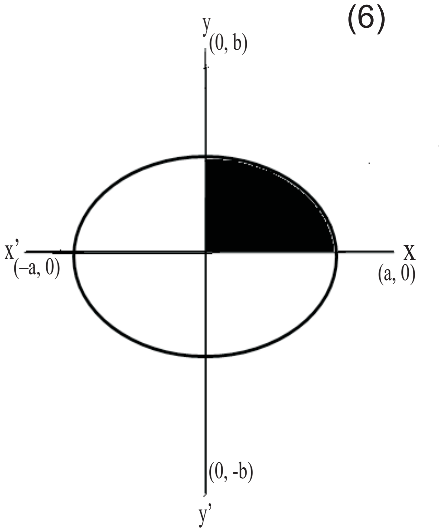
Solution 24 : Considering horizontal strips

Area of Ellipse

$$= 4\int_0^b x\,dy$$

$$= \frac{4a}{b}\left[\frac{y}{2}\sqrt{b^2 - y^2} + \frac{b^2}{2}\,\text{Sin}^{-1}\frac{y}{b}\right]_0^b$$

$$= \frac{4a \;\; b^2 \;\pi}{b\;.2\;.\;2} = \pi ab$$



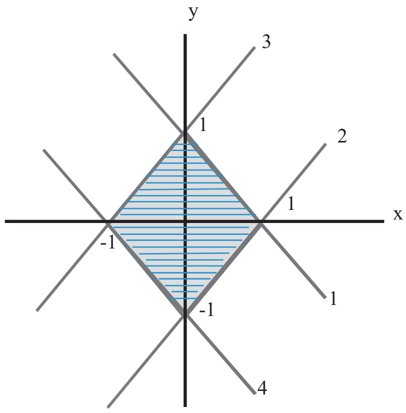
OR

Using integration, find the area bounded by the curve $|x| + |y| = 1$

Solution : Given Curve $|x| + |y| = 1$

$x + y = 1 \rightarrow (1)$ $\qquad$ $x - y = 1 \rightarrow (2)$

$-x + y = 1 \rightarrow (3)$ $\qquad$ $-x - y = 1 \rightarrow (4)$



$$\text{Required area} = 4\int_{0}^{1} \underset{\text{line 1}}{y}\, dx = 4\left[x - \frac{x^2}{2}\right]_0^1$$

$$= 4\left[\frac{1}{2}\right] = 2$$

Q25. Find the shortest distance between the lines

$\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(\hat{i} - 3\hat{j} + 2\hat{k})$

and $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu(2\hat{i} + 3\hat{j} + \hat{k})$

Solution 25 :

Here $\vec{a}_1 = \hat{i} + 2\hat{j} + 3\hat{k}, \vec{b}_1 = \hat{i} - 3\hat{j} + 2\hat{k}$

$\vec{a}_2 = 4\hat{i} + 5\hat{j} + 6\hat{k}, \vec{b}_2 = 2\hat{i} + 3\hat{j} + \hat{k}$

$\vec{a}_2 - \vec{a}_1 = 3\hat{i} + 3\hat{j} + 3\hat{k}$

$\vec{b}_1 \times \vec{b}_2 = -9\hat{i} + 3\hat{j} + 9\hat{k}$

$|\vec{b}_1 \times \vec{b}_2| = \sqrt{171}$

$$\text{S.D.} = \left|\frac{(\vec{b}_1 \times \vec{b}_2) \cdot (\vec{a}_2 - \vec{a}_1)}{(\vec{b}_1 \times \vec{b}_2)}\right| = \left|\frac{-27 + 9 + 27}{\sqrt{171}}\right| = \frac{9}{\sqrt{171}} \text{ units}$$

OR

Find the angle between the line

$$\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$$

and the plane $10x + 2y - 11z = 3$

Solution : $\vec{r} = (-\hat{i} + 3\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 6\hat{k})$

$$\operatorname{Sin}\theta = \left|\frac{(2\hat{i} + 3\hat{j} + 6\hat{k}) \cdot (10\hat{i} + 2\hat{j} - 11\hat{k})}{\sqrt{2^2 + 3^2 + 6^2} \cdot \sqrt{10^2 + 2^2 + (11)^2}}\right|$$

$= \dfrac{8}{21}$

$\theta = \text{Sin}^{-1}\dfrac{8}{21}$

Q26. Find the absolute maximum value and absolute minimum value of the function.

$f(x) = x^3$ in the interval $[-2, 2]$

Solution 26 : $f(x) = x^3$, $x \in [-2, 2]$

$f'(x) = 0$

$3x^2 = 0$

$x = 0 \in [-2, 2]$

Absolute maximum value of $f(x) = 8$ at $x = 2$

Absolute minimum value of $f(x) = -8$, at $x = -2$

OR

Find the equations of tangent and normal to the curve

$x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2$ at $(1, 1)$

Solution 26 : Differentiating $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 2$

$$\frac{dy}{dx} = -\left(\frac{y}{x}\right)^{\frac{1}{3}}$$

Slope of tangent at $(1, 1)$ $\left.\dfrac{dy}{dx}\right]_{(1,1)} = -1$

Equation of tangent $y + x - 2 = 0$

Equation of normal is $y - x = 0$

Q27. Minimize $z = -3x + 4y$ subject to

$x + 2y \leqslant 8$

$3x + 2y \leqslant 12$

$x, y \geqslant 0$ graphically.

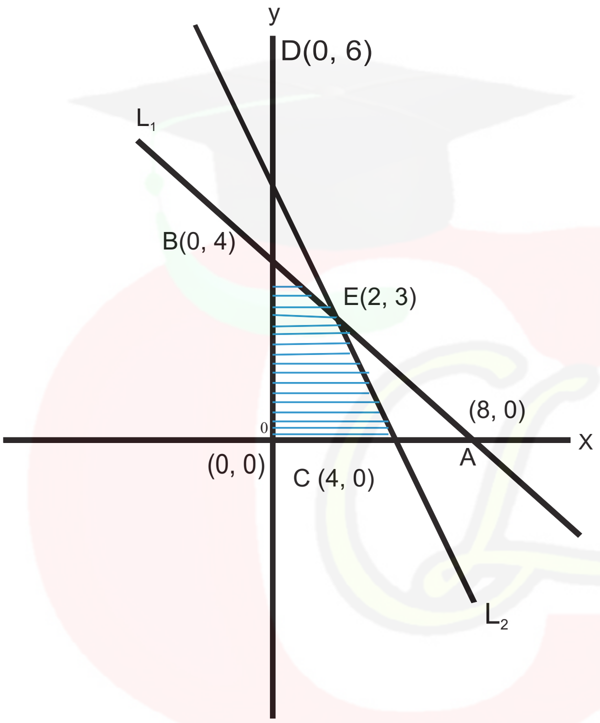
Solution 27 :

$L_1 : x + 2y = 8$

x	8	0
y	0	4

$L_2 : 3x + 2y = 12$

x	4	0
y	0	6



Corner Points	$z = -3x + 4y$
0(0, 0)	0
B (0, 4)	16
C(4, 0)	–12
E (2, 3)	6

→ Minimum

Z is minimum at C (4, 0), x = 4, y = 0