1. write the number of all possible matrices of order 2×3 with each entry 1 or 2.

2. If $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$ and $BA = (b_{i,j})$, Find $b_{21} + b_{32}$.

3. if $\overrightarrow{a} = 4, \overrightarrow{b} = 3$ and $\overrightarrow{a}, \overrightarrow{b} = 6\sqrt{3}$,the nfind the value of $\overrightarrow{a} \times \overrightarrow{b}$

4. What are the coordinates of the point which is the reflection of the point (α, β, γ) in the XZ-plane?

5. write the value of $A = \begin{bmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{bmatrix}$

6. Find the position vector of the point which divides the join of points with position $\overrightarrow{a} + 3\overrightarrow{b}$ and $\overrightarrow{a} \cdot \overrightarrow{b}$ internally in the ratio 1: 3.

7. On her birthday Seema decided to donate some money to children of an orphanage home. If there were 8 children less, every one would have got |10 more. However, if there were 16 children more, every one would have got |10 less. Using matrix method, find the number of children and the amount distributed by Seema. What values are reflected by Seema's decision?

8. Show that the function $R(x)$ given by: $R(x) = \begin{cases} \frac{e^{1/x}-1}{e^{1/x}+1}, & \text{if } x \neq 0, \\ -1, & \text{if } x = 0 \end{cases}$ is discontinuous at $x = 0$.

9. Evaluate: $\int_1^5 |x-1| + |x-2| + |x-3| \, dx$

10. Evaluate: $\int_0^\pi \frac{x \sin x}{1 + 3\cos^2 x} dx$

11. Find: $\int (3x+5)\sqrt{5} + 4x - 2x^2 \, dx$

12. solve the differential equation : $(x^2 + 3xy + y^2)\, dx - x^2\, dy = 0\, given\, that\, y = 0, when\, x = 1$.

13. $solveforx$: $\tan^{-1} \frac{2-x}{2+x} = \frac{1}{2} \tan^{-1} \frac{x}{2}, x > 0$

14. prove that $2sin^{-1} 1\frac{3}{5} - tan^{-1} \frac{17}{31} = \frac{\pi}{4}$

15. A committee of 4 students is selected at random from a group consisting of 7 boys and 4 girls. Find the probability that there are exactly 2 boys in the committee, given that at least one girl must be there in the committee.

16. A random variable X has the following probability distributio:

X	0	1	2	3	4	5	6
P(X)	c	2c	2c	3c	c^2	$2c^2$	$7c^2$+c

Find the value of c and also calculate mean of the distribution.

17. Show that the lines $\frac{x-1}{3} = \frac{y-1}{-1} = \frac{z-1}{0}$ and $\frac{x-4}{2} = \frac{y}{0} = \frac{z+1}{3}$ intersect. Find their point of intersection.

18. $x = e^{cos2t}$ and $y = e^{sin2t}$,prove that $\frac{dy}{dx} = \frac{-ylogx}{xlogy}$.

19. verify mean value theorem for the function $f(x) = 2sinx + sin2x$ on $[0, \pi]$.

20. Find the angle between the vectors $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$ if $\overrightarrow{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\overrightarrow{b} = 3\hat{i} + \hat{j} - 2\hat{k}$, and hence find a vector perpendicular to both $\overrightarrow{a} + \overrightarrow{b}$ and $\overrightarrow{a} - \overrightarrow{b}$.

21. Find the equation of the tangent line to the curve $y = \sqrt{5x-3} - 5$, which is parallel to line $4x - 2y + 5 = 0$.

22. solve the differential equation : $x\frac{dy}{dx} + y - x + xycotx = 0; x \neq 0$.

23. Find : $\int \frac{2x+1}{(x^2+1)(x^2+4)} dx$.

24. solve for x : $\begin{bmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{bmatrix} = 0$, using properties of determinants.

25. using elementary row operations find the inverse of matrix $A=\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ and hence solve the following system of equations $3x - 3y + 4z = 21, 2x - 3y + 4z = 20, -y + z = 5$.

26. using integration, find the area of the angle formed by negative x-axis and tangent and normal to the circle $x^2 + y^2 = 9$ at $(-1, 2\sqrt{2})$.

27. A company manufactures two types of cardigans type A and type B. It costs ₹360 to make a type A cardigan and ₹120 to make a type B cardigan. The company can make at most 300 cardigans and spend at most ₹72,000 a day. The number of cardigans of type B cannot exceed the number of cardigans of type A by more than 200. The company makes a profit of ₹100 for each cardigan of type A and ₹50 for every cardigan of type B.
Formulate this problem as a linear programming problem to maximise the profit to the company. Solve it graphically and find maximum profit.

28. A, B and C throw a pair of dice in that order alternately till one of them gets a total of 9 and wins the game. Find their respective probabilities of winning. if A starts first.

29. Show that height of the cylinder of greatest volume which can be inscribed in a right circular cone of height h and semi-vertical angle a is one-third that of the cone and the greatest volume of the cylinder is $\frac{4}{27}\pi h^3 tan^2\alpha$.

30. Find the intervals in which the function $f(x) = \frac{4sinx}{2+cosx} - x; 0 \leq x \leq 2\pi$ is strictly increasing or strictly decreasing.

31. Find the coordinates of the foot of perpendicular and perpendicular distance from the point $P(4, 3, 2)$ to the plane $x + 2y + 3z = 2$.Also find the image of P in the plane.

32. show that the relation R defined by (a, b) R $(c, d) \Rightarrow a + d = b + c$ on the $A \times A$,where $a = \{1, 2, 3, ...10\}$ is an equivaience relation.Hence write the equivalance class $[(3, 4)]; a, b, c, d \epsilon A$.