1. Find $\bar{a} \times \bar{b}$ where $\bar{a} = \bar{i} + 2\bar{j} - 3\bar{k}$ and $\bar{b} = 2\bar{i} + 3\bar{j} + 4\bar{k}$.

2. Show that the vectors $\bar{a} = 3\bar{i} + 5\bar{j} - 7\bar{k}$ and $\bar{b} = 7\bar{i} + 3\bar{k}$ are perpendicular.

3. Find the cosine of the angle between vectors $\bar{a} = 2\bar{i} - 3\bar{j} + 4\bar{k}$ and $\bar{b} = -4\bar{i} + 6\bar{j} - 8\bar{k}$.

4. Find the projection of $\bar{a}$ on $\bar{b}$ where $\bar{a} = 2\bar{i} + 3\bar{j} - \bar{k}$ and $\bar{b} = 3\bar{i} - 2\bar{j} + 4\bar{k}$.

5. Find a unit vector perpendicular to both the vectors $2\bar{i} - \bar{j} + 3\bar{k}$ and $3\bar{i} + \bar{j} - 4\bar{k}$.

6. Find two vectors each of magnitude 5 and perpendicular to both the vectors $\bar{i} - \bar{j} + \bar{k}$ and $2\bar{i} - 3\bar{j} - \bar{k}$.

7. Find the projection of $\overline{AB}$ on the line $\overline{CD}$, where $A \equiv (2, -3, 0)$, $B \equiv (1, 4, -2)$, $C(4, 6, 8)$ and $D \equiv (7, 0, 10)$.

8. Find the sine of the angle between the vectors $\bar{i} + \bar{j} + \bar{k}$ and $2\bar{i} - \bar{j} + 2\bar{k}$.

9. Find the slope of the line segment AB if $A \equiv (-2, 3)$ and $B \equiv (4, -1)$.

10. Find the point of intersection and the angle between the lines $4x + 5 = 0$ and $6y - 7 = 0$.

11. If $(7, a)$, $(-5, 2)$ and $(3, 6)$ are collinear, find 'a'.

12. Find the equation of the line through $(2, 3)$ and parallel to $3x - 4y - 7 = 0$.

13. Find the equation of the line having y intercept -2 and perpendicular to $3x + y = 7$.

14. Find the angle between the lines, $3x - y + 4 = 0$ and $6x + 3y - 5 = 0$.

15. A(2, -5), B(-2, 1) and C(4, 7) are the vertices of a triangle ABC. Find the equation of [a] the line BC [b] altitude from A

16. Express the following angles in degrees   (1) $\left(\dfrac{5\pi}{12}\right)^c$ (2) 8^c (3) $\left(\dfrac{-7\pi}{24}\right)^c$

17. Find the length of the arc of a circle of radius 9 cms, subtending an angle of $40°$ in the centre.

18. The angles of a triangle are in the ratio 2 : 3 : 5. Find them in degrees and radians.

19. The sum of two angles is given as 3^c and their difference is given as $40°$. Find the angles in radians.

20. Solve the inequality : $3(x - 2) \leqslant 5x + 8$

21. Solve the inequality : $4x - 7 < 3 - x$

22. Graph the common solution set of $x \geqslant 1,\ x + 2y \leqslant 4,$

23. Draw the graph and find the common solution set of the following inequalities
$4x + 3y \leqslant 12,\ 3x + 5y \leqslant 15,\ x, y \geqslant 0.$

24. If $A = \begin{bmatrix} 2 & 3 & 4 \\ -3 & 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -4 & -5 \\ 0 & 2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 5 & -1 & 2 \\ 7 & 0 & 3 \end{bmatrix}$, find the matrix X such that $2A + 3B - X = C$.

25. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, show that $A^2 - 4A$ is a scalar matrix.

25. Find x, y and z if $\left(\begin{bmatrix} 3 & 2 & 5 \\ 2 & 1 & 3 \\ 1 & 2 & 3 \end{bmatrix} - 2 \begin{bmatrix} 1 & 2 & 5 \\ 1 & 6 & 1 \\ 2 & 3 & 1 \end{bmatrix} \right) \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

27. If $A = \begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$, $B = \begin{bmatrix} \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \\ 1 & \omega & \omega^2 \end{bmatrix}$ and ω is a complex cube root of unity, then show that
AB = O, where O is the zero matrix of oreder 2.

28. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & x \\ 4 & y \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, find x and y.

29. Solve for X and Y if $2X - Y = \begin{bmatrix} 3 & -6 & 0 \\ 2 & -1 & 3 \end{bmatrix}$ and $X + 2Y = \begin{bmatrix} 4 & 1 & 10 \\ -1 & 2 & 2 \end{bmatrix}$.

1. Evaluate : $\displaystyle\lim_{x\to 0} \dfrac{3^x - 5^x}{x}$

2. Evaluate : $\displaystyle\lim_{x\to a} \dfrac{x^3 - a^3}{x^{10} - a^{10}}$

3. Evaluate : $\displaystyle\lim_{x\to 0} \dfrac{\sin 3x - \sin 5x}{x}$

4. Differentiate $x^4 - 2\sin x + 3 \cos x$ w.r.t. x.

5. Find the derivative of $(x^4 + 4)(x^2 - 3)$ w.r.t. x.

6. Find the derivative of $\dfrac{x}{x^2 + 1}$ w.r.t. x.

7. Evaluate : $\displaystyle\int \left(5x^4 - 3x^2 + 4\sin x - \dfrac{5}{x^2} + \dfrac{6}{x^3} \right) dx$

8. Evaluate : $\displaystyle\lim_{x\to 1} \dfrac{4^{x-1} - 2^x + 1}{(x - 1)^2}$

9. Evaluate : $\displaystyle\lim_{x\to 2} \dfrac{x^3 - 3x^2 + 4}{x^3 - 2x^2 - 4x + 8}$

10. Evaluate : $\displaystyle\lim_{x\to 0} \dfrac{\cos 4x - \cos 8x}{x \tan x}$

11. Evaluate : $\displaystyle\lim_{x\to \frac{\pi}{4}} \dfrac{1 - \tan x}{\pi - 4x}$

12. Evaluate : $\displaystyle\lim_{x\to 4} \dfrac{\sqrt{2x +1} - 3}{x^2 - x - 12}$

13. Evaluate : $\displaystyle\lim_{x\to 0} \dfrac{\sin x \,(1 - \cos x)}{x^3}$

14. Evaluate : $\displaystyle\lim_{x\to 0} \dfrac{(6^x - 1)^2}{x \log (1 + 2x)}$

15. How many different arrangements can be made using all the letters of the word LOGARITHM ?
    (i) How many of these begin with T and end with I ?
    (ii) How many of these begin and end with a vowel ?
    (iii) How many of these begin with a consonant and end with a vowel ?
    (iv) In how many of these, do the vowels occupy the odd places ?

16. Find n if $^{n}C_4 = 5\,(^{n}P_3)$

17. If $^{12}C_5 + 2\,^{12}C_4 + ^{12}C_3 = {}^{14}C_x$, find x.

18. If $^{28}C_{2r} : {}^{24}C_{2r-4} = 225 : 11$, find r.

19. Simplifying each term, write down the binomial expansion of $(2x - 1)^5$.

20. Find the the middle term in the expansion of
$$\left(x + \frac{2}{x} \right)^6$$

21. Find the term independent of x in $\left(2x - \dfrac{1}{x^2} \right)^6$

22. By the first principle find the derivative of $\cos x$ w.r.t x.

23. By the first principle find the derivative of a^x w.r.t x.

24. If for $f(x) = \lambda x^2 + \mu x + 12$, $f'(4) = 15$ and $f'(2) = 11$, then find λ and μ.

25. Evaluate : $\displaystyle\int (2x^2 - 3)^2\, dx$

25. Evaluate : $\displaystyle\int \frac{15}{\sqrt{2x+11} \;+\; \sqrt{2x-4}}\, dx$

27. If $f'(x) = 4x^3 - 3x^2 + 2x + k$ and $f(0) = 1$, $f(1) = 4$, find $f(x)$.

28.. Evaluate : $\displaystyle\int \sin 4x \cos 6x\, dx$

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