

BiBihar Board Class 10th Mathematics- 121-327 -Set E - 2025 Question Paper

Time Allowed :3 Hour 15 minutes	Maximum Marks :100	Total Questions :138
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. Candidate must enter his/her Question Booklet Serial No. (10 digits) in the DMR Answer Sheet.
2. Candidates are required to give their answers in their own words as far as practicable.
3. Figures in the right-hand margin indicate full marks.
4. 15 minutes of extra time have been allotted for the candidates to read the questions carefully.
5. This question booklet is divided into two sections – Section-A and Section-B.
6. In Section-A, there are 100 objective type questions, out of which any 50 questions are to be answered (each carrying 1 mark). First 50 answers will be evaluated by the computer in case more than 50 questions are answered. For answering these, darken the circle with blue/black ball pen against the correct option on the OMR Answer Sheet provided. Do not use whitener, liquid, blade, nail, etc. on the OMR sheet, otherwise the result will be treated as invalid.
7. In Section-B, there are 30 short answer type questions, out of which any 15 questions are to be answered (each carrying 2 marks). Apart from these, there are 8 long answer type questions, out of which any 4 questions are to be answered (each carrying 5 marks).
8. Use of any electronic appliances is strictly prohibited.

1. $|\vec{i} - \vec{j} - 3\vec{k}| =$

- (1) 11
- (2) $\sqrt{11}$
- (3) $\sqrt{7}$
- (4) $\sqrt{10}$

2. $(4\vec{i} + 3\vec{j})^2 =$

- (1) 7
- (2) 19

- (3) 25
 - (4) 49
-

3. $(7\vec{i} - 8\vec{j} + 9\vec{k}) \cdot (\vec{i} - \vec{j} + \vec{k}) =$

- (1) 25
 - (2) 24
 - (3) 23
 - (4) 22
-

4. $\vec{i} \cdot \vec{i} + \vec{i} \cdot \vec{j} + \vec{j} \cdot \vec{j} + \vec{j} \cdot \vec{k} + \vec{k} \cdot \vec{k} =$

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

5. $(11\vec{i} + \vec{j} + \vec{k}) \cdot (\vec{i} + \vec{j} + 11\vec{k}) =$

- (1) 22
 - (2) 23
 - (3) 24
 - (4) 20
-

6. $(\vec{k} \times \vec{j}) \cdot \vec{i} =$

- (1) 0
 - (2) 1
 - (3) -1
 - (4) $2\vec{i}$
-

7. $(\vec{i} - 2\vec{j} + 5\vec{k}) \cdot (-2\vec{i} + 4\vec{j} + 2\vec{k}) =$

- (1) 20
- (2) 18
- (3) 0

(4) 4

8. $(\vec{i} \times \vec{j}) + (\vec{i} \times \vec{i}) =$

- (1) $2\vec{k}$
 - (2) 1
 - (3) \vec{k}
 - (4) $-\vec{k}$
-

9. Which of the following is the objective function?

- (1) $x \geq 10$
 - (2) $y \geq 0$
 - (3) $z = 7x + 3y$
 - (4) All of these
-

10. The maximum value of $Z = 2x + y$ subject to constraints $x + y \leq 35$, $x \geq 0$, $y \geq 0$ is

- (1) 35
 - (2) 105
 - (3) 70
 - (4) 140
-

11. $\cot^{-1} \left(\tan \frac{\pi}{7} \right) =$

- (1) $\frac{\pi}{7}$
 - (2) $\frac{5\pi}{14}$
 - (3) $\frac{9\pi}{14}$
 - (4) $\frac{3\pi}{14}$
-

12. $\cos^{-1} \left(\cos \frac{8\pi}{5} \right) =$

- (1) $\frac{8\pi}{5}$
- (2) $\frac{2\pi}{5}$
- (3) $\frac{\pi}{5}$
- (4) $\frac{3\pi}{5}$

13. $\tan^{-1}(-\sqrt{3}) =$

- (1) $\frac{\pi}{6}$
- (2) $\frac{\pi}{3}$
- (3) $\frac{2\pi}{3}$
- (4) $-\frac{\pi}{3}$

14. $\tan^{-1}(\sqrt{3}) - \cot^{-1}(-\sqrt{3}) =$

- (1) 0
- (2) $-\frac{\pi}{2}$
- (3) π
- (4) $\frac{\pi}{2}$

15. $\sin(\sin^{-1} \frac{2\pi}{3}) + \tan^{-1}(\tan \frac{3\pi}{4}) =$

- (1) $\frac{17\pi}{12}$
- (2) $\frac{5\pi}{12}$
- (3) $\frac{\pi}{12}$
- (4) $-\frac{\pi}{12}$

16. $\tan^{-1} \frac{1}{2} + \tan^{-1} \frac{1}{3} =$

- (1) π
- (2) $\frac{\pi}{4}$
- (3) $\frac{\pi}{2}$
- (4) $\frac{\pi}{3}$

17. $\sin(\sin^{-1} \frac{1}{5} + \cos^{-1} x) = 1, \Rightarrow x =$

- (1) 1
 - (2) 0
 - (3) $\frac{4}{5}$
 - (4) $\frac{1}{5}$
-

18. $\begin{vmatrix} 21 & 11 & 10 \\ 25 & 15 & 10 \\ 64 & 27 & 37 \end{vmatrix} =$

- (1) 1190
 - (2) 841
 - (3) 0
 - (4) 1
-

19. $\begin{vmatrix} 10 & 4 \\ 13 & 5 \end{vmatrix} =$

- (1) 102
 - (2) 2
 - (3) -2
 - (4) -102
-

20. $\begin{vmatrix} x & 15 \\ 4 & 4 \end{vmatrix} = 0, \Rightarrow x =$

- (1) 15
 - (2) -15
 - (3) 12
 - (4) 60
-

21. $\int \frac{dx}{x^2 + 4} =$

- (1) $\frac{1}{4} \tan^{-1} \frac{x}{4} + k$
 - (2) $\frac{1}{2} \tan^{-1} \frac{x}{2} + k$
 - (3) $\frac{1}{2} \tan^{-1} \frac{2}{x} + k$
 - (4) $2 \tan^{-1} \frac{x}{2} + k$
-

22. $\int \frac{\cos 2x}{\cos x + \sin x} dx =$

- (1) $\sin x - \cos x + k$
- (2) $-\sin x - \cos x + k$

- (3) $\sin x + \cos x + k$
(4) $-\sin x + \cos x + k$
-

23. $\frac{d}{dx}\{\cos(\pi x + \sin \pi)\} =$

- (1) $-\sin(\pi x + \sin \pi)$
(2) $-\pi \sin(\pi x)$
(3) $-\sin \pi x$
(4) $\sin x$
-

24. $\int \tan(\tan^{-1} x) dx =$

- (1) $\frac{x^2}{2} + k$
(2) $\frac{x}{2} + k$
(3) $x + k$
(4) $\log(\sec(\tan^{-1} x)) + k$
-

25. $\int \frac{dx}{e^{-x}} =$

- (1) $-\frac{1}{e^{-x}} + k$
(2) $e^x + k$
(3) $\frac{1}{e^{-x}} - \frac{1}{x^2} + k$
(4) $-e^{-x} + k$
-

26. $\int \log x^2 dx =$

- (1) $\frac{1}{x^2} + k$
(2) $\frac{x}{2} + k$
(3) $x \log x - x + k$
(4) $2(x \log x - x) + k$
-

27. $\int (\sin 3x + 4 \sin^3 x) dx =$

- (1) $3 \sin x + k$
 - (2) $-3 \cos x + k$
 - (3) $\frac{\cos 3x}{3} + 12 \sin^2 x + k$
 - (4) $\frac{\cos 3x}{3} + 4 \cos^3 x + k$
-

28. $\int_{-1}^1 \sin^7 x \cos^{13} x dx =$

- (1) 0
 - (2) 1
 - (3) 20
 - (4) 6
-

29. $\int_0^1 \frac{4 \tan^{-1} x}{1+x^2} dx =$

- (1) $\frac{\pi^2}{4}$
 - (2) $\frac{\pi^2}{8}$
 - (3) $\frac{\pi}{4}$
 - (4) $\frac{\pi}{8}$
-

30. $\int_0^1 3x^2 dx =$

- (1) 3
 - (2) $\frac{1}{3}$
 - (3) 1
 - (4) $\frac{1}{9}$
-

31. $\int_{\alpha}^{\beta} f(x) dx + \int_{\beta}^{\alpha} f(x) dx =$

(1) 2

(2) 1

(3) 0

(4) $2 \int_{\alpha}^{\beta} f(x) dx$

32. $\frac{d}{dx} \left\{ \begin{vmatrix} x & x \\ 2 & x \end{vmatrix} \right\} =$

(1) $x^2 - 2x$

(2) $2x - 2$

(3) $2x + 2$

(4) $x - 2$

33. $\frac{d}{dx} \left\{ \lim_{n \rightarrow 1} \frac{x^n - 1}{n + 1} \right\} =$

(1) 0

(2) $\frac{1}{2}$

(3) $\frac{1}{2}x$

(4) 1

34. $\frac{d}{dx} \{ \log_3 x \times \log_x 3 \} =$

(1) $\frac{1}{9}$

(2) 9

(3) $2 \log 3$

(4) 0

35. $\frac{d}{dx} (\log x^{100}) =$

(1) $\frac{1}{x^{100}}$

(2) $\frac{1}{x}$

(3) $\frac{100}{x}$

$$(4) \frac{1}{100x}$$

$$36. \frac{d}{dx} \left[\sin^{-1}(2x\sqrt{1-x^2}) \right] =$$

$$(1) 2 \sin^{-1} x$$

$$(2) \frac{1}{\sqrt{1-x^2}}$$

$$(3) \frac{2}{\sqrt{1-x^2}}$$

$$(4) \frac{1}{\sqrt{1-4x^2(1-x^2)}}$$

$$37. \int e^{2 \log x} dx =$$

$$(1) e^{2 \log x} + k$$

$$(2) \frac{x^2}{2} + k$$

$$(3) \frac{x^3}{3} + k$$

$$(4) 3x^3 + k$$

$$38. \frac{d}{dx} \left\{ \begin{vmatrix} x & 15 \\ 4 & 4 \end{vmatrix} \right\} =$$

$$(1) 4x$$

$$(2) 4$$

$$(3) -60$$

$$(4) -4$$

$$39. \int x^m \cdot x^n dx =$$

$$(1) \frac{x^{m+1} \cdot x^{n+1}}{m+n+2} + k$$

$$(2) \frac{x^{m+n}}{m+n} + k$$

$$(3) \frac{x^{m+n+1}}{m+n+1} + k$$

$$(4) (m+n)x^{m+n-1} + k$$

$$40. \int e^3 \cdot e^x dx =$$

- (1) $e^x + k$
 - (2) $\frac{e^{3+x}}{3} + k$
 - (3) $e^{x+3} + k$
 - (4) $3e^{x+3} + k$
-

$$41. \begin{vmatrix} 3 & \sqrt{3} & \sqrt{3} \\ 4 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix} =$$

- (1) 0
 - (2) 12
 - (3) $4\sqrt{3}$
 - (4) $3 - 4\sqrt{3}$
-

$$42. 5 \begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix} =$$

- (1) $\begin{vmatrix} 5 & 10 \\ 15 & 20 \end{vmatrix}$
 - (2) $\begin{vmatrix} 5 & 2 \\ 3 & 20 \end{vmatrix}$
 - (3) $\begin{vmatrix} 5 & 10 \\ 3 & 4 \end{vmatrix}$
 - (4) $\begin{vmatrix} 1 & 10 \\ 15 & 20 \end{vmatrix}$
-

$$43. \begin{bmatrix} 5 & -1 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix} =$$

- (1) $\begin{bmatrix} 7 & 11 \\ 33 & 34 \end{bmatrix}$
- (2) $\begin{bmatrix} 7 & 1 \\ 33 & 34 \end{bmatrix}$

$$(3) \begin{bmatrix} 7 & 1 \\ 34 & 33 \end{bmatrix}$$

$$(4) \begin{bmatrix} 16 & 5 \\ 39 & 25 \end{bmatrix}$$

44. If $A = [1 \ 2 \ 3]$, then $A' =$

$$(1) [1 \ 2 \ 3]$$

$$(2) \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$$

$$(3) [3 \ 2 \ 1]$$

$$(4) \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

45. $\frac{d}{dx}(\log 5x) =$

$$(1) \frac{1}{5x}$$

$$(2) \frac{1}{x}$$

$$(3) \frac{x}{5}$$

$$(4) \log 5 + \frac{1}{x}$$

46. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} =$

$$(1) \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$$

$$(2) \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

$$(3) \begin{bmatrix} 1 & 0 \\ 2 & 4 \end{bmatrix}$$

$$(4) \begin{bmatrix} 1 & 3 \\ 2 & 0 \end{bmatrix}$$

47. If $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then $A^{100} =$

- (1) $100A$
 - (2) $101A$
 - (3) A
 - (4) $99A$
-

48. $[6 \ 5] \begin{bmatrix} -1 \\ 1 \end{bmatrix} =$

- (1) $[-6 \ 5]$
 - (2) $\begin{bmatrix} -6 \\ 5 \end{bmatrix}$
 - (3) $[-1 \ -1]$
 - (4) $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$
-

49. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix} =$

- (1) $\begin{bmatrix} 4 & 8 \\ 12 & 16 \end{bmatrix}$
 - (2) $\begin{bmatrix} 5 & 2 \\ 3 & 8 \end{bmatrix}$
 - (3) $\begin{bmatrix} 4 & 8 \\ 12 & 16 \end{bmatrix}$
 - (4) $\begin{bmatrix} 4 & 12 \\ 8 & 16 \end{bmatrix}$
-

50. $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} =$

- (1) $\begin{bmatrix} 4 \\ 25 \end{bmatrix}$
- (2) $\begin{bmatrix} 4 \\ 10 \end{bmatrix}$
- (3) $\begin{bmatrix} 19 \\ 45 \end{bmatrix}$

$$(4) \begin{bmatrix} 19 \\ 45 \end{bmatrix}$$

$$51. \int \frac{dx}{x \log x} =$$

- (1) $\log x + k$
 - (2) $(\log x)^2 + k$
 - (3) $\log(\log x) + k$
 - (4) $\frac{1}{\log x} + k$
-

$$52. \int \frac{x-3}{x^2-9} dx =$$

- (1) $\log(x-3) + k$
 - (2) $\log(x+3) + k$
 - (3) $-\frac{1}{(x+3)^2} + k$
 - (4) $\frac{x^2}{2} - 3x + k$
-

$$53. \int \frac{dx}{x^2+2x+5} =$$

- (1) $\tan^{-1}\left(\frac{x+1}{2}\right) + k$
 - (2) $\frac{1}{2} \tan^{-1}\left(\frac{x+1}{2}\right) + k$
 - (3) $\log(x^2+2x+5) + k$
 - (4) $\frac{1}{x^2+2x+5} + k$
-

$$54. \int \frac{e^x(1-x)}{(1+x)^2} dx =$$

- (1) $\frac{e^x}{1+x} + k$
- (2) $e^x(1+x) + k$
- (3) $-\frac{e^x}{(1+x)^2} + k$
- (4) $e^x(x-1) + k$

55. $\int \sin x \cos x dx =$

- (1) $\frac{\sin^2 x}{2} + k$
- (2) $\frac{\cos^2 x}{2} + k$
- (3) $-\frac{\sin^2 x}{2} + k$
- (4) $\frac{1}{2} \sin 2x + k$

56. $\int \frac{1}{\sqrt{1-4x^2}} dx =$

- (1) $\frac{1}{2} \sin^{-1}(2x) + k$
- (2) $\sin^{-1}(4x) + k$
- (3) $\sin^{-1}(2x) + k$
- (4) $\frac{1}{4} \sin^{-1}(4x) + k$

57. $\int xe^x dx =$

- (1) $e^x(x-1) + k$
- (2) $e^x(x+1) + k$
- (3) $e^x + k$
- (4) $xe^x + k$

58. $\int \frac{x^2}{(1+x^3)^2} dx =$

- (1) $-\frac{1}{3(1+x^3)} + k$
 - (2) $\frac{1}{3(1+x^3)} + k$
 - (3) $\log(1+x^3) + k$
 - (4) $\frac{x^3}{3(1+x^3)} + k$
-

59. $\int_0^{\pi/2} \sin^2 x \, dx =$

- (1) $\frac{\pi}{2}$
 - (2) $\frac{\pi}{4}$
 - (3) 1
 - (4) 0
-

60. $\int_0^1 3x^2 \, dx =$

- (1) 3
 - (2) 1
 - (3) $\frac{1}{3}$
 - (4) 0
-

61. The maximum value of $Z = 3x - y$ subject to constraints $x + y \leq 8$, $x \geq 0$, $y \geq 0$ is

- (1) -8
 - (2) 24
 - (3) 16
 - (4) 8
-

62. The chance of getting a doublet in a throw of 2 dice is

- (1) $\frac{2}{3}$
 - (2) $\frac{1}{6}$
 - (3) $\frac{5}{6}$
 - (4) $\frac{5}{36}$
-

63. Addition theorem of probability is

- (1) $P(A \cup B) = P(A) + P(B)$
- (2) $P(A \cup B) = P(A) + P(B) + P(A \cap B)$

$$(3) P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$(4) P(A \cup B) = P(A) P(B)$$

64. If odds in favour of event E be $a : b$, then $P(E) =$

$$(1) \frac{a}{a - b}$$

$$(2) \frac{a}{a + b}$$

$$(3) \frac{b}{a + b}$$

$$(4) \frac{b}{a - b}$$

65. Multiplication theorem of probability is

$$(1) P(A \cap B) = P(A) P(B)$$

$$(2) P(A \cap B) = P(A) + P(B) - P(A \cup B)$$

$$(3) P(A \cap B) = P(A) P(B | A)$$

(4) None of these

66. $\frac{d}{dx}(e^{3-2x}) =$

$$(1) e^{3-2x}$$

$$(2) 2e^{3-2x}$$

$$(3) -2e^{3-2x}$$

$$(4) -e^{3-2x}$$

67. $\int 2^x dx =$

$$(1) \frac{2^{x+1}}{\log 2} + k$$

$$(2) 2^{x+1} \log 2 + k$$

$$(3) (x + 1)2^x + k$$

$$(4) 2^{x+1} + k$$

68. $\int \frac{(\sqrt{x} + 1)^2}{x\sqrt{x} + 2x + \sqrt{x}} dx =$

- (1) $\sqrt{x} + k$
 - (2) $\frac{1}{2}\sqrt{x} + k$
 - (3) $2\sqrt{x} + k$
 - (4) $2x + k$
-

69. $\int_{-1}^1 \sin^{13} x \cos^{12} x dx =$

- (1) 0
 - (2) 1
 - (3) $\frac{1}{2}$
 - (4) 2
-

70. $\int_0^2 e^x dx =$

- (1) e^2
 - (2) $e^2 - 2$
 - (3) $e^2 - 1$
 - (4) $e - 1$
-

71. $[3 \ -2] \begin{bmatrix} -1 \\ 1 \end{bmatrix} =$

- (1) $[3 \ 2]$
 - (2) $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$
 - (3) $\begin{bmatrix} 1 & 1 \end{bmatrix}$
 - (4) $\begin{bmatrix} 5 \end{bmatrix}$
-

72. $[4] [2 \ -2] =$

- (1) $[8 \ -8]$
- (2) $[0]$

- (3) $\begin{bmatrix} 8 \\ -8 \end{bmatrix}$
(4) $\begin{bmatrix} 6 & 2 \end{bmatrix}$
-

73. Adjoint matrix of $\begin{bmatrix} 2 & 3 \\ 5 & 4 \end{bmatrix}$ is

- (1) $\begin{bmatrix} 4 & -5 \\ -3 & 2 \end{bmatrix}$
(2) $\begin{bmatrix} 4 & -3 \\ -5 & 2 \end{bmatrix}$
(3) $\begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix}$
(4) $\begin{bmatrix} 4 & 3 \\ 5 & 2 \end{bmatrix}$
-

74. $\frac{d}{dx}(\log x^9) =$

- (1) $\frac{1}{x^9}$
(2) $\frac{1}{9x}$
(3) $\frac{x}{9}$
(4) $\frac{1}{x}$
-

75. The direction ratios of the straight line $\frac{x-19}{13} = \frac{y-17}{11} = \frac{z-15}{9}$ are

- (1) 19, 17, 15
(2) 13, 11, 9
(3) 19, 17, 9
(4) None of these
-

76. The line $\frac{x-11}{12} = \frac{y-12}{13} = \frac{z+13}{14}$ passes through which point?

- (1) (11, 12, 13)
(2) (11, 12, -13)

- (3) (12, 13, 14)
(4) (-11, -12, 13)
-

77. If the direction ratios of two mutually perpendicular lines are 5, 2, 4 and 4, 8, x , then the value of x is

- (1) 9
(2) -9
(3) 8
(4) -8
-

78. Equation of a plane parallel to the plane $9x - 8y + 7z = 10$ is

- (1) $9x - 8y - 7z = 5$
(2) $9x - 8y + 7z = 5$
(3) $9x + 8y + 7z = 5$
(4) $9x - y + 7z = 5$
-

79. Which of the following is an equation of a plane parallel to $9x - 8y + 7z = 10$?

- (1) $9x - 8y - 7z = 5$
(2) $9x - 8y + 7z = 5$
(3) $9x + 8y + 7z = 5$
(4) $9x - y + 7z = 5$
-

80. Equation of a plane parallel to the plane $9x - 8y + 7z = 10$ is

- (1) $9x - 8y - 7z = 5$
(2) $9x - 8y + 7z = 5$
(3) $9x + 8y + 7z = 5$
(4) $9x - y + 7z = 5$
-

81. $\int_0^a \frac{x dx}{2\sqrt{a^2 - x^2}} =$

- (1) $\frac{a^2}{2}$
(2) $\frac{a}{2}$
-

- (3) $\frac{a}{4}$
(4) a
-

82. $\int_0^a \frac{dx}{\sqrt{x}} =$

- (1) $2\sqrt{x}$
(2) $2\sqrt{a}$
(3) \sqrt{x}
(4) \sqrt{a}
-

83. $\int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\sin x + \sqrt{\cos x}}} dx =$

- (1) π
(2) $\frac{\pi}{2}$
(3) $\frac{\pi}{4}$
(4) 2π
-

84. $\int_0^{\pi/2} \log(\tan x) dx =$

- (1) $\frac{\pi}{4}$
(2) $\frac{\pi}{2}$
(3) 0
(4) π
-

85. $\int_0^1 e^x dx =$

- (1) e
(2) $1 - e$
(3) $e - 1$
(4) 0

86. $\int_0^{\pi/2} \sin x \cdot \cos x \, dx =$

- (1) 1
- (2) $\frac{1}{2}$
- (3) -1
- (4) $\frac{1}{4}$

87. $\int_0^1 (x + 2x + 3x^2 + 4x^3) \, dx =$

- (1) 10
- (2) $\frac{5}{2}$
- (3) $\frac{7}{2}$
- (4) $\frac{1}{2}$

88. $\int_{-1}^1 \sin x \cdot \cos^3 x \, dx =$

- (1) 2
- (2) 1
- (3) 0
- (4) -1

89. $\int_1^9 \frac{dx}{\sqrt{x}} =$

- (1) 8
- (2) 4
- (3) 2
- (4) 12

90. $2 \int_1^9 \frac{dx}{\sqrt{x}} =$

- (1) 8
 - (2) 4
 - (3) 2
 - (4) 12
-

91. $\frac{d}{dx}(\sec^2 x - \tan^2 x) =$

- (1) $2 \sec^2 x - 2 \tan x$
 - (2) $2 \sec x - 2 \tan x$
 - (3) 1
 - (4) 0
-

92. $\frac{d}{dx}(e^2 + 2ex) =$

- (1) $2e + 2x$
 - (2) $4e$
 - (3) $2e$
 - (4) $2x$
-

93. $\frac{d}{dx} \left\{ \lim_{x \rightarrow a} \frac{x^n + a^n}{x + a} \right\} =$

- (1) $\frac{a^n}{a}$
 - (2) $\frac{2a^n}{a}$
 - (3) 1
 - (4) 0
-

94. $\frac{d}{dx}(\sin^{-1} 2x) =$

- (1) $\frac{1}{\sqrt{1 - 4x^2}}$
- (2) $\frac{2}{\sqrt{1 - x^2}}$
- (3) $\frac{2}{\sqrt{1 - 4x^2}}$

$$(4) \frac{\pi}{2} - \cos^{-1} 2x$$

$$95. \frac{d}{dx} \left[\frac{(x+2)(x^2-2x+4)}{x^3+8} \right] =$$

$$(1) \frac{2x-2}{3x^2}$$

$$(2) \frac{(x^2-2x+4) + (2x-2)}{3x^2}$$

$$(3) 1$$

$$(4) 0$$

$$96. \frac{d}{dx} [2\sqrt{x}] =$$

$$(1) \frac{2}{\sqrt{x}}$$

$$(2) \frac{1}{2\sqrt{x}}$$

$$(3) \frac{1}{\sqrt{x}}$$

$$(4) -\frac{1}{\sqrt{x}}$$

$$97. \frac{d}{dx} [1 - \cos 2x + 2 \cos^2 x] =$$

$$(1) -4 \sin x \cos x$$

$$(2) 1$$

$$(3) 0$$

$$(4) 2$$

$$98. \frac{d}{dx} (\log x^2 + \log a^2) =$$

$$(1) \frac{1}{x^2} + \frac{1}{a^2}$$

$$(2) \frac{2}{x} + \frac{2}{a}$$

$$(3) \frac{1}{x}$$

$$(4) \frac{2}{x}$$

99. $\frac{d}{dx} [2 \tan^{-1} x] =$

(1) $\frac{1}{1+x^2}$

(2) $-\frac{1}{1+4x^2}$

(3) $\frac{2}{1+4x^2}$

(4) $\frac{2}{1+x^2}$

100. $\frac{d}{dx} (e^{x^2}) =$

(1) e^{x^2}

(2) e^{2x}

(3) $2xe^{x^2}$

(4) $2xe^{2x}$

Section-B

1. Prove that $\begin{vmatrix} 23 & 12 & 11 \\ 36 & 10 & 26 \\ 63 & 26 & 37 \end{vmatrix} = 0.$

2. Evaluate the determinant $\begin{vmatrix} 4 & 9 & 7 \\ 3 & 5 & 7 \\ 5 & 4 & 5 \end{vmatrix}.$

3. If $A = \begin{bmatrix} 5 & -1 \\ 4 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, then prove that $AB \neq BA.$

4. If $y = \cos \sqrt{\cos \sqrt{x}}$, then find $\frac{dy}{dx}.$

5. Prove that the function $f : R \rightarrow R$, where $f(x) = x^2$, is many-one into.

6. Find the value of the determinant $\begin{vmatrix} 1 & 5 & 7 \\ 1 & 7 & 9 \\ 1 & 8 & 10 \end{vmatrix}$.

7. Minimize $Z = 7x + 8y$ subject to the constraints $3x + 4y \leq 24$, $x \geq 0$, $y \geq 0$.

8. If $P(A) = \frac{3}{8}$, $P(B) = \frac{1}{2}$, and $P(A \cap B) = \frac{1}{4}$, then find $P\left(\frac{A'}{B'}\right)$ and $P\left(\frac{B'}{A'}\right)$.

9. A die is thrown. Find the probability of occurrence of a number less than 5 if it is known that only an odd number occurs.

10. Write in the simplest form: $\tan^{-1}\left(\sqrt{\frac{1 - \cos 2x}{1 + \cos 2x}}\right)$.

11. Prove that $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right) = \frac{1}{2}\tan^{-1}x$.

12. If $\left|\frac{x}{x} \frac{5}{x}\right| = 24$, then find the value of x .

13. Find the principal value of $\csc^{-1} 2$.

14. Find the value of $\int_{-1}^1 \sin^{23} x \cos^{12} x dx$.

15. Integrate $\int \frac{dx}{\sin^2 x \cos^2 x}$.

16. Integrate: $\int \frac{\sec x}{\sec x + \tan x} dx.$

17. Integrate: $\int \frac{x dx}{1 + x^4}.$

18. Integrate: $\int e^{\log_e(x \sin x)} dx.$

19. Find the angle between the planes $x + 2y + 3z = 6$ and $3x - 3y + z = 1.$

20. Find the equation of the plane passing through the point $(1, 2, 3)$ and parallel to the plane $3x + 4y - 5z = 0.$

21. Maximize $Z = 3x + 4y$ subject to $x + y \leq 4, x \geq 0, y \geq 0.$

22. In the curve $x^2 + y^2 = 36$, obtain the slope of the curve at the point where $x = -5, y = 6.$

23. Examine whether the function $f(x) = x^2 - 4x + 3$ is increasing or decreasing at the following values of x : (i) $x = 1$ (ii) $x = 3$

24. Prove that $2 \cos^{-1} x = \cos^{-1}(2x^2 - 1).$

25. Find the matrices A and B when

$$A + B = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 2 & 2 \\ 1 & 1 & 2 \end{bmatrix}, \quad A - B = \begin{bmatrix} 1 & 4 & 4 \\ 4 & 2 & 0 \\ -1 & -1 & 2 \end{bmatrix}.$$

26. Prove that $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b}) = a^2 - b^2.$

27. Find the value of x , when the following vectors are perpendicular to one another: $\vec{x} = x\hat{i} - 3\hat{j} + 5\hat{k}$, $\vec{y} = -x\hat{i} + x\hat{j} + 2\hat{k}$.

28. Find the area of the region between the x-axis and the curve $y = \sin x$, from $x = 0$ to $x = \pi$.

29. Solve: $\frac{dy}{dx} = e^{x+y}$.

30. If $y = \tan^{-1} \left(\frac{\cos x + \sin x}{\cos x - \sin x} \right)$, then find $\frac{dy}{dx}$.

Section-C

31. $\int \frac{x}{(x-1)^2(x+2)} dx$

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

33. $\tan^{-1} x + \tan^{-1} y = \frac{1}{2} \sin^{-1} \left(\frac{2(x+y)(1-xy)}{(1+x^2)(1+y^2)} \right)$.

34. Prove that $\begin{vmatrix} a+b & b & c \\ b+c & c & a \\ c+a & a & b \end{vmatrix} = 3abc - a^3 - b^3 - c^3$.

35. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 1 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$, then find $(AB)^{-1}$.

36. Find the acute angle between the line $\frac{x}{1} = \frac{y}{3} = \frac{z}{0}$ and the plane $2x + y = 5$.

37. Maximize and minimize $Z = 5x + 10y$ subject to $x + 2y \leq 120$, $x + y \geq 60$, $x - 2y \geq 0$, $x, y \geq 0$.

38. A speaks the truth in 75% of cases and B in 80% of cases. In what percentage of cases are they likely to contradict each other when stating the same fact?
