KCET (Mathematics)

TOP 200 QUESTIONS

1. Let R be a relation in N defined by $R = \left\{\left(1+x, 1+x^2\right) : x \le 5, x \in N\right\}$. Which of the following is false?
(A) $R = \{(2, 2), (3, 5), (4,10), (5, 17), (6, 25)\}$
(B) Domain of $R = \{2, 3, 4, 5, 6\}$
(C) Range of $R = \{2, 5, 10, 17, 26\}$
(D) None of these

2. Determine the range of the relation R defined by $R : \{(x, x + 5\}: x \in \{0, 1, 2, 3, 4, 5\}\}$.
(A) $\{5, 6, 7, 8, 9, 10\}$
(B) $\{0, 1, 2\}$
(C) $\{0, 1, 2, 3\}$
(D) $\{0, 1, 2, 3, 4, 5\}$

3. If $R = \{(x, |x|) \mid x$ is a real number$\}$ is a relation. Then fine the range of R.
(A) $[-1, \infty)$
(B) $[1, \infty)$
(C) R
(D) $R^+ \cup \{0\}$

4. Let $A = \{1, 2, 3, 4\}$ and $B = \{x, y, z\}$. Consider the subset $R = \{(1, x), (1, y), (2, z), (3, x)\}$ Then which of the following is true?
(A) Domain of $R = \{1, 2, 3\}$
(B) Domain of $R = \{x, y, z\}$
(C) Range of $R = \{1, 2, 3\}$
(D) R is not a relation from A to B.

5. The range of the function $f(x) = 3x^2 + 7x + 10$ is:
(A) $[10, \infty)$
(B) $\left[\frac{71}{12}, \infty\right)$
(C) $[1, \infty)$
(D) None of these

6. If the domain of the function $f(x) = x^2 - 6x + 7$ is $(-\infty, \infty)$ then the range of function is:
(A) $[-2, \infty]$ (B) $(-\infty, \infty)$
(C) $(-2, 1)$ (D) $(-\infty, -2)$

7. Find the range of the function f defined by $f(x) = \frac{x+2}{|x+2|}$.
(A) $[-1, 1]$ (B) $(-1, 1)$
(C) $(0, 1)$ (D) $\{-1, 1\}$

8. The domain of the function $f(x) = \frac{|x+3|}{x+3}$ is:
(A) $\{-3\}$ (B) $R-\{-3\}$
(C) $R-\{3\}$ (D) R

9. If $f(x) = [x]^2 - 5[x] + 6 = 0$ where [.] denote the greatest integer function, then"
(A) $x \in [3, 4]$
(B) $x \in (2, 4]$
(C) $x \in [2, 4]$
(D) $x \in [2, 4)$

10. Domain of the function $\frac{1}{\sqrt{x^2 - 1}}$ is:
(A) $(-\infty, -1) \cup (1, \infty)$
(B) $(-\infty, -1] \cup (1, \infty)$
(C) $(-\infty, -1] \cup [1, \infty)$
(D) None of these

11. Let $A = \{1, 2, 3\}$ and consider the relation $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$ Then, R is:
(A) reflexive but not symmetric
(B) reflexive but not transitive
(C) symmetric and transitive
(D) neither symmetric nor transitive

12. Let $A = \{a, b, c\}$ and the relation R be defined on A as follows: $R = \{(a, a), (b, c), (a, b)\}$. Then, write minimum number of ordered pairs to be added in R to make R reflexive and transitive:

(A) 1 (B) 2

(C) 3 (D) 4

13. Let R be a relation on the set N be defined by $\{(x, y) : x, y \in N, 2x + y = 41\}$. Then, R is:

(A) Reflexive

(B) Symmetric

(C) Transitive

(D) None of these

14. Let R be the relation on the set of all real numbers defined by aRb iff $|a - b| \leq 1$. Then, R is:

(A) Reflexive and symmetric

(B) Symmetric only

(C) Transitive only

(D) None of these

15. n/m means that n is a factor of m, then the relation '/' is:

(A) reflexive and symmetric

(B) transitive and reflexive

(C) reflexive, transitive and symmetric

(D) reflexive, transitive and not symmetric

16. If $R = \{(x, y) \mid x \in N, y \in N, x + 3y = 12\}$ then R^{-1} is

(A) $\{(9, 1), (2, 6), (3, 3)\}$

(B) $\{(3, 1), (2, 4), (3, 6)\}$

(C) $\{(3, 3), (2, 6), (1, 9)\}$

(D) $\{(1, 3), (1, 6), (1, 9)\}$

17. Let us define a relation R in R as aRb if $a \geq b$. Then R is

(A) an equivalence relation

(B) reflexive and transitive but not symmetric

(C) symmetric and transitive but not reflexive

(D) reflexive, transitive and symmetric

18. If $A = \{1, 2, 3\}$, $B = \{1, 4, 6, 9\}$ and R is a relation from A to B defined by 'x is greater than y'. Then range of R is

(A) $\{1, 4, 6, 9\}$ (B) $\{4, 6, 9\}$

(C) $\{1\}$ (D) $\{4, 6\}$

19. Identity relation R in a set A is

(A) reflexive (B) symmetric

(C) transitive (D) equivalence

20. The relation $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$ on set $A = \{1, 2, 3\}$ is

(A) reflexive but not symmetric

(B) reflexive but not transitive

(C) symmetric and transitive

(D) neither symmetric nor transitive

21. A and B are two sets having 3 and 4 elements respectively and having 2 elements in common. The number of relations which can be defined from A to B is

(A) 2^5 (B) $2^{10} - 1$

(C) $2^{11} - 1$ (D) 2^{12}

22. Let $A = \{1, 2, 3\}$ and $R = \{(2, 2), (3, 1), (1, 3)\}$, then the relation R on A is

(A) Reflexive (B) Symmetric

(C) Transitive (D) None of these

23. If $A = \{x : x^2 - 3x + 2 = 0\}$ and R is a universal relation on A, then R is

(A) $\{(1, 1), (2, 2)\}$

(B) $\{(1, 1)\}$

(C) $\{\phi\}$

(D) $\{(1, 1), (1, 2), (2, 1), (2, 2)\}$

24. If R is the relation 'less than' from $A = \{1, 2, 3, 4, 5\}$ to $B = \{1, 4\}$, the set of ordered pairs corresponding to R, then the inverse of R is

(A) $\{(3, 1), (3, 2), (3, 3)\}$

(B) $\{(4, 1), (4, 2), (4, 3)\}$

(C) $\{(4, 3), (4, 4), (4, 5)\}$

(D) $\{(1, 3), (2, 4), (3, 5)\}$

25. If a relation R is defined on the set A on integers as follows: $(a, b) \in R \Leftrightarrow a^2 + b^2 = 25$ then, Domain (R) =

(A) $\{3, 4, 5\}$ (B) $\{0, 3, 4, 5\}$

(C) $\{0, \pm 3, \pm 4, \pm 5\}$ (D) None of these

26. If $A = [a_{ij}]$ is a scalar matrix of order $n \times n$, such that $a_{ij} = k$ for all $i = j$, then trace of A =

(A) nk (B) $n + k$
(C) n/k (D) 1

27. $A_{n\times n}$ and $B_{n\times n}$ are diagonal matrices then AB = _____ matrix

(A) square (B) diagonal
(C) scalar (D) rectangular

28. Let A be a square matrix, consider

(1) $A + A^T$ (2) AA^T
(3) $A^T A$ (4) $A^T + A$
(5) $A - A^T$ (6) $A^T - A$

Then

(A) all are symmetric matrices
(B) (2), (4), (6) are symmetric matrices
(C) (1), (2), (3), (4) are symmetric matrices and (5), (6) are skew symmetric matrices
(D) 5, 6 are symmetric

29. If A, B are symmetric matrices of the same order then $AB - BA$ is

(A) Symmetric matrix
(B) Skew symmetric matrix
(C) Diagonal matrix
(D) Identity matrix

30. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$, $kA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$ then arrange the values of k, a, b in ascending order

(A) k, a, b (B) b, a, k
(C) a, k, b (D) b, k, a

31. If $A - 2B = \begin{pmatrix} 1 & -2 \\ 3 & 0 \end{pmatrix}$ and $2A - 3B = \begin{pmatrix} -3 & 3 \\ 1 & -1 \end{pmatrix}$ then B =

(A) $\begin{pmatrix} -5 & 7 \\ 5 & 1 \end{pmatrix}$ (B) $\begin{pmatrix} -5 & 7 \\ -5 & -1 \end{pmatrix}$
(C) $\begin{pmatrix} -5 & 7 \\ 5 & -1 \end{pmatrix}$ (D) $\begin{pmatrix} -5 & -7 \\ -5 & -1 \end{pmatrix}$

32. If $A = \begin{bmatrix} 2 & 3 \\ 0 & 4 \end{bmatrix}$, then $A^2 - 5I =$

(A) $\begin{bmatrix} 4 & 18 \\ 0 & 16 \end{bmatrix}$ (B) $\begin{bmatrix} -1 & 18 \\ 0 & 11 \end{bmatrix}$
(C) $\begin{bmatrix} 1 & -13 \\ 5 & -11 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & -13 \\ 5 & 11 \end{bmatrix}$

33. If $AB = A$ and $BA = B$ then

(A) $A = 2B$
(B) $A^2 = A$ and $B^2 = B$
(C) $2A = B$
(D) cannot be determined

34. $\begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix}^n = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ if n is

(A) odd
(B) any natural number
(C) even
(D) not possible

35. If $A = \begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ then $A^2 =$

(A) A (B) $-A$
(C) Null matrix (D) $2A$

36. If matrix $A = [a_{ij}]_{2\times 2}$, where $a_{ij} = 1$ if $i \neq j = 0$, if $i = j$ then A^2 is equal to

(A) I (B) A
(C) 0 (D) None

37. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is a

(A) identity matrix
(B) symmetric matrix
(C) skew symmetric matrix
(D) None of these

38. If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to

(A) A (B) $I - A$

(C) $I + A$ (D) 3

39. If $AB = O$, then

(A) $A = O$

(B) $B = O$

(C) A and B need not be zero matrices

(D) A and B are zero matrices

40. If A is skew-symmetric matrix and n is odd positive integer, then A^n is

(A) a symmetric matrix

(B) skew-symmetric matrix

(C) diagonal matrix

(D) triangular matrix

41. If $A = [a_{ij}]_{2\times2}$, where $a_{ij} = i + j$, then A is equal to

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

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

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

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

42. If $A = [a_{ij}]_{2\times2}$, where $a_{ij} = \dfrac{(i \times 2j)^2}{2}$, then A is equal

(A) $\begin{bmatrix} 9 & 25 \\ 8 & 18 \end{bmatrix}$

(B) $\begin{bmatrix} 9/2 & 25/2 \\ 8 & 18 \end{bmatrix}$

(C) $\begin{bmatrix} 9 & 25 \\ 4 & 9 \end{bmatrix}$

(D) $\begin{bmatrix} 9/2 & 15/2 \\ 4 & 9 \end{bmatrix}$

43. If $A = [a_{ij}]_{4\times3}$, where $a_{ij} = \dfrac{i-j}{i+j}$, then find A.

(A) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/2 & 0 & 1/5 \\ 1/3 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

(B) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/3 & 0 & -1/5 \\ 1/2 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & -3 & -1/2 \\ 2 & 0 & 5 \\ 3 & 5 & 0 \\ 3/5 & 3 & 7 \end{bmatrix}$

(D) $\begin{bmatrix} 0 & 1/3 & 1/2 \\ -1/3 & 0 & 1/5 \\ -1/2 & -1/5 & 0 \\ -3/5 & -1/3 & -1/7 \end{bmatrix}$

44. If a matrix has 16 elements, then which of the following will not be a possible order of the matrix?

(A) 1×16 (B) 2×8

(C) 8×2 (D) 16×4

45. The construction of 3×4 matrix A whose elements are given by $\dfrac{(i+j)^2}{2}$ is

(A) $\begin{bmatrix} 2 & 9/2 & 8 & 25 \\ 9 & 4 & 5 & 18 \\ 8 & 25 & 18 & 49 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & 9/2 & 25 & 9 \\ 9/2 & 5/2 & 5 & 45/2 \\ 25 & 18 & 25 & 9/2 \end{bmatrix}$

(C) $\begin{bmatrix} 2 & 9/2 & 8 & 25/2 \\ 9/2 & 8 & 25/2 & 18 \\ 8 & 25/2 & 18 & 49/2 \end{bmatrix}$

(D) None of these

46. If $\begin{vmatrix} \alpha & 3 & 4 \\ 1 & 2 & 1 \\ 1 & 4 & 1 \end{vmatrix} = 0$, then the value of α is

(A) 1 (B) 2
(C) 3 (D) 4

47. If $\begin{vmatrix} -\alpha & 3 & 4 \\ -1 & -2 & 1 \\ 1 & -4 & 1 \end{vmatrix} = 0$, then the value of α is

(A) 1 (B) –15
(C) 3 (D) 15

48. If $\begin{vmatrix} 5 & 3 & -1 \\ -7 & x & -3 \\ 9 & 6 & -2 \end{vmatrix} = 0$, then the value of x is

(A) 3 (B) 5
(C) 7 (D) –1

49. The roots of the equation $\begin{vmatrix} x & 0 & 8 \\ 4 & 1 & 3 \\ 2 & 0 & x \end{vmatrix} = 0$ are

(A) –4, 4 (B) 2, –4
(C) 2, 4 (D) 2, 8

50. Find the area of the triangle whose vertices are (–2, 6), (2, –6) and (2, –5)

(A) 3 sq. units (B) 5 sq. units
(C) 4 sq. units (D) 2 sq. units

51. If the vertices of a triangle are (–2, 4), (3, –2) and (1, 5), then the area of the triangle is

(A) 40 sq. units (B) 30 sq. units
(C) 11.5 sq. units (D) 10 sq. units

52. Find area of the triangle with vertices (–2, –3), (3, 2), (–1, –8).

(A) –12 (B) 12
(C) –15 (D) 15

53. If the area of a triangle *ABC*, with vertices *A*(1, 3), *B*(0, 0) and *C*(*k*, 0) is 9 sq. units, then find the value of *k*.

(A) 2 (B) 3
(C) 4 (D) 6

54. Find values of *k* if area of triangle is 4 sq. units and vertices are (2, 0), (0, –4), (0, *k*).

(A) 0, 4 (B) 0, 8
(C) 3, 2 (D) –8, 0

55. If area of triangle is 35 sq. units with vertices (2, –6), (5, 4) and (*k*, 4). Then *k* is

(A) 12 (B) –2
(C) –12, –2 (D) 12, –2

56. If $\det(A) = \begin{vmatrix} \cos\theta & 1 \\ 0 & \cos\theta \end{vmatrix} = \frac{1}{2}$ where $\theta \in \left[\frac{\pi}{2}, \pi\right]$, $\theta =$

(A) $\frac{\pi}{4}$ (B) $\frac{3\pi}{4}$
(C) $\frac{\pi}{6}$ (D) $\frac{5\pi}{6}$

57. If $\det(A) = \begin{vmatrix} \sin\theta & 0 \\ 1 & \cos\theta \end{vmatrix} = -\frac{1}{4}$ where $\theta \in \left[\pi, \frac{3\pi}{2}\right]$, Then $\theta =$

(A) $\frac{\pi}{12}$ (B) $\frac{5\pi}{6}$
(C) $\frac{7\pi}{6}$ (D) $\frac{7\pi}{12}$

58. If $\det(A) = \begin{vmatrix} 1 & \sin\theta \\ 2\sin\theta & 1 \end{vmatrix} = -\frac{\sqrt{3}}{2}$, where $\theta \in \left[\pi, \frac{3\pi}{2}\right]$, then $\theta =$

(A) $\frac{\pi}{3}$
(B) $\frac{\pi}{6}$
(C) $\frac{7\pi}{12}$
(D) $\frac{5\pi}{6}$

59. If $\det(A)=\begin{vmatrix}\sec\theta & 1\\ 1 & \sec\theta\end{vmatrix}=\frac{1}{3}$, where $\theta\in\left[\frac{3\pi}{2},2\pi\right]$, then θ=

(A) $\frac{\pi}{6}$ (B) $\frac{5\pi}{6}$
(C) $\frac{11\pi}{6}$ (D) $\frac{5\pi}{3}$

60. If $\det(A)=\begin{vmatrix}\sin x & \cos x\\ -1 & 1\end{vmatrix}$. Then the interval in which det (A) is one and onto is

(A) $\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$ & $[-1, 1]$c
(B) $\left[\frac{-\pi}{4},\frac{3\pi}{4}\right]$ & $[-1, 1]$
(C) $\left[\frac{\pi}{2},\frac{3\pi}{2}\right]$ & $[-\sqrt{2},\sqrt{2}]$
(D) $\left[\frac{-3\pi}{4},\frac{\pi}{4}\right]$ & $[-\sqrt{2},\sqrt{2}]$

61. If $\det(A)=\begin{vmatrix}\cos x & \sin x\\ -1 & \sqrt{3}\end{vmatrix}$, then the interval in which det (A) is one-one and onto is

(A) $\left[\frac{-5\pi}{6},\frac{\pi}{6}\right]$ & $[-2, 2]$
(B) $\left[\frac{\pi}{6},\frac{\pi}{3}\right]$ & $[-1, 1]$
(C) R & R
(D) $(0, \pi)$ & $(-1, 1)$

62. If $\det(A)=\begin{vmatrix}\cos x & \sin x\\ 1 & \sqrt{3}\end{vmatrix}$, then the interval in which det (A) is one-one and onto is

(A) $\left[\frac{-\pi}{3},\frac{2\pi}{3}\right]$ & $[-2, 2]$
(B) $\left[\frac{-\pi}{6},\frac{5\pi}{6}\right]$ & $[-2, 2]$
(C) $\left[\frac{-\pi}{2},\frac{\pi}{2}\right]$ & $[-1, 1]$
(D) R & R

63. If A is a matrix of order 3 × 3, and $|A| = 4$, then $|5A|$ =

(A) 400 (B) 20
(C) 600 (D) 500

64. If A a matrix of order 4 × 4 & $|A| = 3$, then $|6A|^{-1}$=

(A) $\frac{1}{6480}$ (B) $\frac{1}{80}$
(C) 6480 (D) $\frac{1}{3888}$

65. If $|A| = 3$, $|B| = -6$ where A and B are of order 3 × 3, then $|4AB|$ =

(A) –1152
(B) –72
(C) 1/72
(D) 48

66. If $f(x)$ is continuous at $x = 0$, where $f(x) = (1 + 2x)^{1/x}$, for $x \neq 0$, then find $f(0)$

(A) $1/e$ (B) $1/e^2$
(C) e^2 (D) $2e$

67. If $f(x)$ is continuous at $x = 0$, where $f(x)=\left\{\frac{2^x-2^{-x}}{\sin x}\right.$, for $x \neq 0$, then find $f(0)$

(A) 1/2 log 2
(B) log 2
(C) 2 log 4
(D) log 4

68. Find the value of k, so that the function

$$f(x)=\begin{cases}\frac{(e^{kx}-1)\sin kx}{x^2}, & \text{for } x\neq 0\\ 4, & \text{for } x=0\end{cases}$$ is continuous at x =0.

(A) ±1 (B) ±2
(C) 0 (D) ±5

69. The value of k for which the function $f(x)=\begin{cases}\left(\frac{4}{5}\right)^{\frac{\tan 4x}{\tan 5x}}, & 0<x<\frac{\pi}{2}\\ k+\frac{2}{5}, & x=\frac{\pi}{2}\end{cases}$ is continuous at $x=\frac{\pi}{2}$, is

(A) 17/20 (B) 3/5
(C) –2/5 (D) 2/5

70. If $f(x)=\begin{cases}\log\left(\sec^2 x\right)^{\cot^2 x}, & \text{for } x\neq 0\\ K, & \text{for } x=0\end{cases}$ is continuous at $x = 0$, then K is

(A) e^{-1} (B) 1
(C) e (D) 0

71. Find the values of a so that the function f defined by $f(x)=\begin{cases}\frac{\sin^2 ax}{x^2}, & x\neq 0\\ 1, & x=0\end{cases}$ is continuous at x = 0.

(A) ±2 (B) 0
(C) ±1 (D) 3

72. If $f(x)=\begin{cases}1+x, & \text{for } x\leq 2\\ 5-x, & \text{for } x>2\end{cases}$, then

(A) $f(x)$ is continuous and differentiable at $x=2$
(B) $f(x)$ is continuous but not differentiable at $x = 2$
(C) $f(x)$ is everywhere differentiable
(D) $f(x)$ is not continuous at $x = 2$

73. If f defined by $f(x)=\begin{cases}x^2\sin\frac{1}{x}, & \text{if } x\neq 0\\ 0, & \text{if } x=0\end{cases}$ is a continuous function at x =

(A) 0 (B) 1
(C) 2 (D) –1

74. Let $f(x)=\begin{cases}\frac{x^3+x^2-16x+20}{(x-2)^2}, & \text{if } x\neq 2\\ b/2, & \text{if } x=2\end{cases}$.

If $f(x)$ is continuous for all x, then b is equal to

(A) 14 (B) 3
(C) 2 (D) 5

75. Let $f(x)$ = [sin x], where [.] is greatest integer function. At $x = \pi/2$, $f(x)$ is

(A) Continuous (B) Discontinuous
(C) Can't be said (D) None of these

76. If $y = \log_7(\log x)$, then find $\frac{dy}{dx}$.

(A) $\frac{1}{x\log 7\log x}$ (B) $\frac{1}{x\log x}$
(C) $\frac{x}{\log 7\log x}$ (D) None of these

77. If $y = \log\sin(e^x + 5x + 8)$, then find $\frac{dy}{dx}$.

(A) $-\left(e^x+5\right)\cdot\cot\left(e^x+5x+8\right)$
(B) $\left(e^x+5\right)\cdot\cot\left(e^x+5x+8\right)$
(C) $\left(e^x+5\right)\cdot\text{cosec}^2\left(e^x+5x+8\right)$
(D) $-\left(e^x+5\right)\cdot\text{cosec}^2\left(e^x+5x+8\right)$

78. If $y = \log_3(\log_e x)$, then find $\frac{dy}{dx}$

(A) $\frac{\log_e 3}{x\log_e x}$
(B) $\frac{1}{x\log_e x\log_e 3}$
(C) $\frac{1}{x\log_e 3}$
(D) $\frac{1}{x\left(\log_e 3\right)^2\log_e x}$

79. If $e^x + e^y = e^{x+y}$, then dy/dx at (2, 2) is

(A) 2 (B) 1

(C) –1 (D) e

80. If $f(x) = \log\left[e^x\left(\frac{3-x}{3+x}\right)^{1/3}\right]$, then $f'(1)$ is equal to

(A) 3/4

(B) 2/3

(C) 1/3

(D) 1/2

81. If $y = \log(\sin(x^2))$, $0 < x < \frac{\pi}{2}$, then $\frac{dy}{dx}$ at $x = \frac{\sqrt{\pi}}{2}$ is

(A) 0 (B) 1

(C) $\pi/4$ (D) $\sqrt{\pi}$

82. If $y = \log_2\log_2(x)$, then $\frac{dy}{dx} =$

(A) $\frac{\log_2 e}{\log_e x}$

(B) $\frac{\log_2 e}{x\log_x 2}$

(C) $\frac{\log_2 x}{\log_e 2}$

(D) $\frac{\log_2 e}{x\log_e x}$

83. If $f(x) = ae^{|x|} + b|x|^2$, a, $b \in R$ and $f(x)$ is differentiable at $x = 0$, then a and b, are

(A) $a = 0$, $b \in R$

(B) $a = 1$, $b = 3$

(C) $a = 1$, $b = 2$

(D) $a = 2$, $b = 3$

84. If $y = (\log x)^2$, then $\frac{dy}{dx}$ at $x = e$ is equal to

(A) 2 (B) $e/2$

(C) e (D) $2/e$

85. $\frac{d}{dx}[\sin x - \cos x]$

(A) $\sqrt{2}\sin\left(x - \frac{\pi}{4}\right)$

(B) $2\sin\left(x + \frac{\pi}{6}\right)$

(C) $\sqrt{2}\sin\left(x + \frac{\pi}{4}\right)$

(D) $2\sin\left(x + \frac{\pi}{3}\right)$

86. $f(x) = x^3$ is

(A) continuous but not differentiable at $x = 3$

(B) continuous and differentiable at $x = 3$

(C) neither continuous nor differentiable at $x = 3$

(D) none of these

87. If $f(x) = \begin{cases} 1 + x, & \text{for } x \le 2 \\ 5 - x, & \text{for } x > 2 \end{cases}$, then

(A) $f(x)$ is continuous and differentiable at $x = 2$

(B) $f(x)$ is continuous but not differentiable at $x = 2$

(C) $f(x)$ is everywhere differentiable

(D) $f(x)$ is not continuous at $x = 2$

88. Differentiate w.r.t. x : $\sin(x^2 + x)$

(A) $(2x + 1)\cos(x^2 + x)$

(B) $(2x - 1)\cos(x^2 + x)$

(C) $-(2x + 1)\cos(x^2 + x)$

(D) $(2x - 1)\cos(x^2 - x)$

89. If $x^2 + \sin y = y^2 + \log(x + y)$; then find dy/dx.

(A) $\frac{1 - 2x(x+y)}{(x+y)\cos y - 2y(x+y) - 1}$

(B) $\frac{1 + 2x(x+y)}{(x+y)\cos y - 2y(x+y) + 1}$

(C) $\frac{1 - x(x+y)}{(x+y)\sin y - 2y(x+y) - 1}$

(D) $\frac{1 + x(x+y)}{(x+y)\cos y - y(x+y) - 1}$

90. If $x = \cos(xy)$; then find dy/dx.

(A) $-\left(\frac{1+y\sin xy}{x\sin xy}\right)$

(B) $\left(\frac{1+y\sin xy}{x\sin xy}\right)$

(C) $\frac{1-y\sin xy}{\sin xy}$

(D) $\frac{1+y\sin xy}{\sin xy}$

91. Differentiate $\log\left(e^x \cdot \sin^5 x\right)$ w.r.t. x

(A) $1 - 5\cot x$

(B) $1 + \cot x$

(C) $1 - 5\cot x^5$

(D) $1 + 5\cot x$

92. Differentiate $\sin^2[\log(2x+3)]$ w.r.t. x

(A) $-\frac{2}{2x+3}\cdot\sin\left[2\log(2x+3)\right]$

(B) $\frac{2}{2x+3}\cdot\sin\left[2\log(2x+3)\right]$

(C) $\frac{2}{2x+3}\cdot\sin\left[\log(2x+3)\right]$

(D) $-\frac{2}{2x+3}\cdot\sin\left[\log(2x+3)\right]$

93. Differentiate $e^{\log\tan x}$ w.r.t. x.

(A) $\sec^2 x$ (B) $-\sec^2 x$

(C) $\sec x \tan x$ (D) $-\sec x \tan x$

94. $(\sec^2 x)^{1/x}$

(A) $\frac{2(\sec^2 x)^{1/x}}{x^2}[x\tan x - \log\sec x]$

(B) $\frac{2\sec x}{x}[x\tan x - \log\sec x]$

(C) $\frac{2\tan^2 x}{x^2}[x\tan x - \log\cos x]$

(D) $\frac{-2(\sec^2 x)^{1/x}}{x^2}[x\tan x - \log\sec x]$

95. Find $\frac{dy}{dx}$, if $x = \sin(\log t)$, $y = \log(\sin t)$

(A) $\frac{t\cot t}{\cos(\log t)}$ (B) $-\frac{t\cot t}{\cos(\log t)}$

(C) $\frac{-t\ \text{coseec}^2 t}{\cos(\log t)}$ (D) $\frac{-t\text{cosec}\ t\ \cot t}{\cos(\log t)}$

96. If $f(x)=\begin{cases} mx^3 \text{ if } x \le 2 \\ 4 \text{ if } x > 2 \end{cases}$ is continuous at $x = 2$, then the value of m is

(A) 1/3 (B) 1/2

(C) 2 (D) 4

97. If $f(x)=\frac{\sqrt{4+x}-2}{x}$, $x \ne 0$ is continuous at $x = 0$, then find $f(0)$.

(A) 2 (B) 1/4

(C) 0 (D) 1/2

98. If $f(\theta)$ is continuous at $\theta=\frac{\pi}{4}$, where

$f(\theta)=\begin{cases} \frac{1-\tan\theta}{1-\sqrt{2}\sin\theta}, & \text{for } \theta \ne \frac{\pi}{4} \\ \frac{k}{2}, & \text{for } \theta = \frac{\pi}{4} \end{cases}$, then $k =$

(A) $2\sqrt{2}$ (B) $4\sqrt{2}$

(C) 2 (D) 4

99. Find the values of a so that the function f defined by $f(x)=\begin{cases} \frac{\sin^2 ax}{x^2}, & x \ne 0 \\ 1, & x = 0 \end{cases}$ is continuous at $x =$ 0.

(A) ± 2 (B) 0

(C) ± 1 (D) 3

100. The number of points at which the function $f(x)=\frac{1}{\log_e |x|}$ is discontinuous, is

(A) 1 (B) 2

(C) 3 (D) ∞

101. Number of points at which $f(x)=\dfrac{1}{x-|x|}$ is not continuous, is

(A) 1 (B) 2
(C) 3 (D) Many points

102. If $f(x)=\begin{cases}\dfrac{\log x-\log 7}{x-7}, & \text{for } x\neq 7\\ 7, & \text{for } x=7\end{cases}$, then at $x=7$

(A) f is continuous
(B) f is discontinuous
(C) $\lim\limits_{x\to 7} f(x)=\dfrac{7}{2}$
(D) None of these

103. If $f(x)=\begin{cases}\dfrac{1-\sin x}{\left(\dfrac{\pi}{2}-x\right)^2}, & \text{for } x\neq\dfrac{\pi}{2}\\ 3, & \text{for } x=\dfrac{\pi}{2}\end{cases}$, then at $x=\dfrac{\pi}{2}$

(A) f is continuous
(B) f is discontinuous
(C) $\lim\limits_{x\to\pi/2} f(x)=1h$
(D) none of these

104. If $f(x)=\dfrac{x^2+3x+5}{x^2-3x+2}$, then f is

(A) continuous except at $x=1, x=2$
(B) continuous except at $x=1$
(C) continuous except at $x=-2$
(D) discontinuous everywhere

105. If $y=\tan^{-1}\left(\dfrac{x+1}{x-1}\right)+\tan^{-1}\left(\dfrac{x-1}{x+1}\right)$, find $\dfrac{dy}{dx}$.

(A) 1 (B) –1
(C) 0 (D) 2

106. If $f(x)=\log_x\{\ln(x)\}$, then $f'(e)=$

(A) $1/e$ (B) e
(C) $-e$ (D) e^2

107. If $f(x)=\log_5\log_3 x$, then $f'(e)$ is equal to

(A) $e\log_e 5$ (B) $e\log_e 3$
(C) $\dfrac{1}{e\log_e 5}$ (D) $\dfrac{1}{e\log_e 3}$

108. If $x^y y^x=16$, then $\dfrac{dy}{dx}$ at (2, 2) is

(A) 1 (B) 2
(C) –1 (D) –2

109. If $x=\cos(2t)$ and $y=\sin^2 t$, then what is $\dfrac{d^2y}{dx^2}$ equal to?

(A) 0 (B) $\sin(2t)$
(C) $-\cos(2t)$ (D) $-\dfrac{1}{2}$

110. If $x=e^{-\cos 2t}$ and $y=e^{-\sin 2t}$, then $\dfrac{dy}{dx}=$

(A) $\dfrac{y\log x}{x\log y}$ (B) $-\dfrac{y\log x}{x\log y}$
(C) $\dfrac{y\log y}{x\log x}$ (D) $-\dfrac{y\log y}{x\log x}$

111. If $x=a\left(t-\dfrac{1}{t}\right)$, $y=a\left(t+\dfrac{1}{t}\right)$, where t be the parameter, then $\dfrac{dy}{dx}=$

(A) y/x (B) $-x/y$
(C) x/y (D) $-y/x$

112. Derivative of $\tan^{-1}\dfrac{x}{\sqrt{1-x^2}}$ with respect to $\sin^{-1}(3x-4x^3)$ is

(A) $\dfrac{1}{\sqrt{1-x^2}}$ (B) $\dfrac{3}{\sqrt{1-x^2}}$
(C) 3 (D) 1/3

113. If $x = \sin^{-1}(3t - 4t^3)$ and $y = \cos^{-1}\left(\sqrt{1-t^2}\right)$, then $\frac{dy}{dx}$ is equal to

(A) 1/2 (B) 2/3
(C) 1/3 (D) 2/5

114. Derivative of $\log_{10}x$ with respect to x^2 is

(A) $2x^2 \log_e 10$ (B) $\frac{\log_{10} e}{2x^2}$
(C) $\frac{\log_e 10}{2x^2}$ (D) $x^2\log_e 10$

115. Let $f(x) = \tan^{-1}x$. Then $f'(x) + f''(x) = 0$, when x is equal to

(A) 0 (B) 1
(C) i (D) $-i$

116. Let $x = \log t$, $t > 0$ and $y + 1 = t^2$. Then $\frac{d^2x}{dy^2} =$

(A) $4e^{2x}$ (B) $-\frac{1}{2}e^{-4x}$
(C) $-\frac{3}{4}e^{-5x}$ (D) $4e^x$

117. The second order derivative of $a \sin^3 t$ with respect to $a \cos^3 t$ at $t = \frac{\pi}{4}$ is

(A) 2 (B) $\frac{1}{12a}$
(C) $\frac{4\sqrt{2}}{3a}$ (D) $\frac{3a}{4\sqrt{2}}$

118. If $x = 3\cos t - 2\cos^3 t$, $y = 3\sin t - 2\sin^3 t$, then $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{6}$ is

(A) $\frac{16}{2\sqrt{3}}$ (B) $-\frac{16}{3}$
(C) $\frac{16}{3}$ (D) $\frac{-16}{2\sqrt{3}}$

119. If $y = e^{ax}\sin bx$, then $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + a^2y$ is

(A) $-a^2y$
(B) $-b^2y$
(C) $-ay$
(D) $-by$

120. If $y = x + e^x$, then $\frac{d^2x}{dy^2}$ is

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

121. The value of $\int \frac{\cos 2x}{\sin^2 2x}dx$ is

(A) $\cot 2x \operatorname{cosec} 2x + c$
(B) $-\left(\frac{1}{2}\right)\operatorname{cosec} 2x + c$
(C) $-\left(\frac{1}{2}\right)\cot 2x + c$
(D) $\operatorname{cosec} 2x \cot 2x + c$

122. The value of $\int \frac{1}{\sin^2 x \cos^2 x}dx =$

(A) $\tan x + \cot x + c$
(B) $\tan x - \cot x + c$
(C) $\tan x \,.\, \cot x + c$
(D) $\tan x - \cot 2x + c$

123. The value of $\int \frac{\sin 2x}{\sin^4 x + \cos^4 x}dx$ is

(A) $\tan^{-1}(\cot^2 x) + c$
(B) $\tan^{-1}(\tan^2 x) + c$
(C) $\tan^{-1}(\sec^2 x) + c$
(D) $\tan^{-1}(\cos^2 x) + c$

124. The value of $\int \frac{dx}{\cos^2 x(4+\tan x)^4}$ is

(A) $\frac{1}{3(4+\tan x)^3}+c$

(B) $-\frac{1}{3(4+\tan x)^3}+c$

(C) $\frac{1}{5(4+\tan x)^3}+c$

(D) $-\frac{1}{5(4+\tan x)^3}+c$

125. The value of $\int \frac{\cos x + x\sin x}{x(x+\cos x)}dx$ is

(A) ln $[x(x + \cos x)] + c$

(B) $\ln\left[\frac{x}{x+\cos x}\right]+c$

(C) $\ln\left[\frac{x+\cos x}{x}\right]+c$

(D) $\ln\left(\frac{x-\cos x}{x}\right)+c$

126. The value of $\int \frac{dx}{\sqrt{(1-x^2)\sin^{-1} x}}$ is

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

(B) $\sqrt{\sin^{-1} x}+c$

(C) $2\sqrt{\sin^{-1} x}+c$

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

127. The value of $\int \frac{x^2}{16+x^6}dx$ is

(A) $(1/4)\tan^{-1}(x^2/4) + c$

(B) $(1/2)\tan^{-1}(x^2/4) + c$

(C) $\tan^{-1}(x/3) + c$

(D) $(1/12)\tan^{-1}(x^3/4) + c$

128. The value of $\int \frac{dx}{\sqrt{x^2+8}}$ is

(A) $\ln\left|x+\sqrt{x^2+8}\right|+c$

(B) $\ln\left|x-\sqrt{x^2+8}\right|+c$

(C) $\tan^{-1}\left(\frac{1}{2\sqrt{2}}\right)+c$

(D) $\sin^{-1}\left(\frac{x}{2\sqrt{2}}\right)+c$

129. The value of $\int \frac{dx}{x^n(1+x^n)^{1/n}}$, , where $n \in N$ is

(A) $\frac{1}{1-n}\left(1+\frac{1}{x^n}\right)^{1-\frac{1}{n}}+c$

(B) $\frac{1}{1+n}\left(1-\frac{1}{x^n}\right)^{1+\frac{1}{n}}+c$

(C) $\frac{1}{1-n}\left(1+\frac{1}{x^n}\right)^{n-1}+c$

(D) $\frac{1}{1-n}\frac{1}{(1+x^n)}+c$

130. The value of $\int \sin^3 x\, dx$ is

(A) $\frac{\sin^4 x}{4}+c$

(B) $\frac{\cos^3 x}{3}+c$

(C) $\frac{\sin 4x}{4}+c$

(D) $\frac{\cos^3 x}{3}-\cos x+c$

131. The value of $\int \frac{\cos 2x}{(\cos x+\sin x)^2}dx$ is

(A) $\ln|\cos x + \sin x| + c$

(B) $\ln|\cos x + \sin x| + c$

(C) $\sin x - \cos x + c$

(D) $\tan 2x + c$

132. The value of $\int \frac{(x^9 - x)^{1/9}}{x^{10}} dx$ is

(A) $\left(1-\frac{1}{x^8}\right)^{19/9} + c$

(B) $\left(1-\frac{1}{x^8}\right)^{10/9} + c$

(C) $\frac{9}{80}\left(1-\frac{1}{x^8}\right)^{10/9} + c$

(D) $\frac{1}{80}\left(1-\frac{1}{x^8}\right)^{10/9} + c$

133. If $\int \frac{dx}{1+\sin x} = a\left(\tan\left(\frac{x}{2}\right)+1\right)^{-1} + c$ then a is

(A) –2 (B) 2

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

134. The value of $\int e^{\tan^{-1}x}\left(\frac{1+x+x^2}{1+x^2}\right)dx$ is

(A) $e^{\tan^{-1}x} + c$ (B) $\tan^{-1}(e^x) + c$

(C) $e^{\tan^{-1}x}x + c$ (D) $e^{\tan^{-1}x} + x + c$

135. The value of $\int e^x \frac{x-1}{(x+1)^3} dx$ is

(A) $\frac{e^x}{x+1} + c$ (B) $\frac{e^x}{(x+1)^2} + c$

(C) $\frac{e^x}{(x+1)^3} + c$ (D) $\frac{e^x}{(x+1)^4} + c$

136. The value of $\int x^n \ln x \, dx$ is

(A) $\frac{x^{n+1}}{n+1} + c$

(B) $\frac{(\ln x)^n}{n} + c$

(C) $\frac{x^{n+1}}{(n+1)^2}[(n+1)\ln x - 1]$

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

137. The value of $\int \frac{x+\sin x}{1+\cos x} dx$ is

(A) $\tan\frac{x}{2} + c$

(B) $\cot\frac{x}{2} + c$

(C) $x\tan\frac{x}{2} + c$

(D) $\frac{1}{2}\cos\frac{x}{2} + c$

138. The value of $\int_0^{\pi/4} \tan^2 x \, dx$ is

(A) 1 (B) $\pi/4$

(C) $1 + \pi/4$ (D) $1 - \pi/4$

139. The value of $\int_{\pi/4}^{\pi/2} \text{cosec}^2 x \, dx$ is

(A) 1/2 (B) 0

(C) 1 (D) –1

140. The value of $\int_0^{\pi/8} \cos^3 4\theta \, d\theta$ is

(A) 2/3 (B) 1/4

(C) 1/3 (D) 1/6

141. If $I_n = \int_0^1 x^n e^{-x} dx \ \forall n \in N$ then $I_7 - 7I_6$ is

(A) $-1/e$ (B) $1/e$

(C) $-e$ (D) e

142. If $(e^x + 1)y\,dy = (y + 1)e^x\,dx$ then the solution of the equation is

(A) $y + \log_e(y + 1) = \log_e(e^y + 1) + c$

(B) $y - \log_e(y + 1) = \log_e(e^x + 1) + c$

(C) $y + \log_e(e^x + 1) = \log_e(e^x + 4) + c$

(D) $\log(e^x + 1) + \log(y + 1) = c$

143. If $\frac{dy}{dx}=\frac{e^x(\sin^2 x+\sin 2x)}{y(2\log_e y+1)}$, then the solution of the equation is

(A) $y^2\log_e y+c=e^x\sin^2 x$

(B) $y\log_e y+e^x\cos^2 x=c$

(C) $y\log_e y-e^x\cos^2 x=c$

(D) $e^x\cdot\sin x=\cos^2 y+c$

144. The solution of the equation $e^{\frac{dy}{dx}}=x+3$, given that when $x=-2$, $y=3$, is

(A) $y=(x+3)\log(x+3)-x+1$

(B) $y=(x+3)\log(x+3)+x+1$

(C) $y=(x+3)\log(x+3)-x-1$

(D) None of (1), (2), (3)

145. The particular solution of $\cos y\,dx+(1+2e^{-x})\sin y\,dy=0$, when $x=0$, $y=\frac{\pi}{4}$ is

(A) $e^x-2=3\sqrt{2}\cos y$

(B) $e^x+2=\sqrt{2}\cos y$

(C) $e^x+2=3\sqrt{2}\cos y$

(D) None of (1), (2), (3)

146. The general solution of $x^2\frac{dy}{dx}=x^2+xy+y^2$ is

(A) $\tan^{-1}\frac{x}{y}=\log|x|+c$

(B) $\tan^{-1}\frac{y}{x}=\log|x|+c$

(C) $y=x\log|x|+c$

(D) $x=y\log|y|+c$

147. Integrating factor of the differential equation $(1-x^2)\frac{dy}{dx}-xy=1$ is

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

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

148. The solution of the differential equation $\frac{dy}{dx}+\frac{2xy}{1+x^2}=\frac{1}{(1+x^2)^2}$ is

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

(B) $y(1+x^2)=\tan^{-1}x+c$

(C) $y\log|1+x^2|=\tan^{-1}x+c$

(D) $y(1+x^2)=\sin^{-1}x+c$

149. The particular solution of $\frac{dy}{dx}=e^{x+y}+x^2e^y$ subject to the condition when $x=0$, $y=0$, is

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

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

(C) $-e^{-y}=e^{x}+\frac{1}{3}x^3-2$

(D) $-e^{-y}=e^{-x}-\frac{1}{3}x^3+2$

150. The general solution of the differential equation $(1+x)(1+y^2)\,dx+(1+y)(1+x^2)\,dy=0$ is

(A) $\tan^{-1}\frac{x+y}{1-xy}+\frac{1}{2}\log_e(1+x^2)(1+y^2)=c$

(B) $\tan^{-1}\frac{x+y}{1-xy}+\log_e(1+x^2)(1+y^2)=c$

(C) $\tan^{-1}\frac{x+y}{1-xy}\log_e(1+x^2)(1+y^2)=c$

(D) $\tan^{-1}\frac{x-y}{1-xy}\log_e(1+x)(1+y)=c$

151. The equation of a curve whose tangent at any point on it, different from origin, has slope $y+\frac{y}{x}$ is

(A) $y=kxe^x$

(B) $y=ke^x$

(C) $y=kx$

(D) $ye^x=kx$

152. The equation of a curve passing through $\left(1, \frac{\pi}{4}\right)$ if the slope of the tangent to the curve at any point $P(x, y)$ is $\frac{y}{x} - \cos^2 \frac{y}{x}$ is

(A) $\tan\frac{y}{x} + \log x = 1$ (B) $\log x + \tan x = 1$

(C) $\tan\frac{y}{x} = \cos x + c$ (D) $\log\frac{y}{x} + \tan x = 1$

153. $\int_0^{\pi/2} \frac{\sin^2 x}{\sin x + \cos x}$ equals

(A) $\frac{1}{\sqrt{2}}\log\left(\sqrt{2}+1\right)$ (B) $\log\left(\sqrt{2}+1\right)$

(C) $\frac{1}{\sqrt{2}}\log\left(\sqrt{2}-1\right)$ (D) $\log\left(\sqrt{2}-1\right)$

154. $\int e^x(\cos x - \sin x)dx$ is equal to

(A) $e^x \cos x + c$
(B) $e^x \sin x + c$
(C) $-e^x \cos x + c$
(D) $-e^x \sin x + c$

155. $\int \frac{\sin x \cos x}{\sqrt{1-\sin^4 x}} dx =$

(A) $\tan^{-1}\left(\sin^2 x\right) + C$

(B) $\tan^{-1}(2\sin x) + C$

(C) $\frac{1}{2}\sin^{-1}\left(\sin^2 x\right) + C$

(D) $\frac{1}{2}\cos^{-1}\left(\sin^2 x\right) + C$

156. $\int \frac{\sec x}{\sec x + \tan x} dx$

(A) $\sec x + \tan x + C$
(B) $\log \sin x + \log \cos x + C$
(C) $\tan x - \sec x + C$
(D) $\log(1 + \sin x) + C$

157. Area of the segment cut off from $y^2 = 2x$ and $y = 4x - 1$ is

(A) 9/32 (B) 1/2
(C) 1/4 (D) –1/19

158. Area included between $x = y$ and $x^2 + y^2 = 4$ in the 1st quadrant is

(A) $\pi/2$ (B) $\pi/4$
(C) 4π (D) 2π

159. Area included between $y^2 = 8x$ and $y = 2x$ is

(A) 1 (B) 1/3
(C) 4/3 (D) 2/3

160. The area bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$ is

(A) 12π (B) 144π
(C) 4π (D) 3π

161. The order of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^3 = \left(1 + \frac{dy}{dx}\right)^{1/2}$$

(A) 3 (B) 2
(C) 1/2 (D) 4

162. Order of the differential equation $\frac{dy}{dx} = \frac{2\sin x + 3}{dy/dx}$ is

(A) 3 (B) 1
(C) 2 (D) 4

163. Find the degree of the differential equation

$$2\frac{d^2y}{dx^2} + 3\sqrt{1 - \left(\frac{dy}{dx}\right)^2} - y = 0$$

(A) 3 (B) 4
(C) 2 (D) 1

164. Find the degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^8+\cos^2\left(\frac{dy}{dx}\right)=0$$

(A) 1 (B) 2
(C) 3 (D) Not defined

165. Solve : $(x+y)^2\frac{dy}{dx}=a^2$

(A) $y=a\tan^{-1}\left(\frac{x-y}{a}\right)+c$

(B) $y=a\tan^{-1}\left(\frac{y}{a}\right)+c$

(C) $y=a\tan^{-1}\left(\frac{x+y}{a}\right)+c$

(D) $y=a\tan^{-1}\left(\frac{x}{a}\right)+c$

166. Solve the differential equation

$$\tan y\frac{dy}{dx}=\sin(x+y)+\sin(x-y).$$

(A) $\sin x+\sec y=c$
(B) $2\cos x+\sec y=c$
(C) $\cos x+\sin x=c$
(D) $2\sin x+\sec y=c$

167. Solve the differential equation $\frac{dy}{dx}=(x+y+1)^2$.

(A) $\tan^{-1}(1+xy)=y+e$
(B) $\tan^{-1}(x+y+1)=x+c$
(C) $\tan^{-1}x=x+c$
(D) $\tan^{-1}y=y+c$

168. Solution of the differential equation

$x\sin\left(\frac{y}{x}\right)\frac{dy}{dx}=y\sin\left(\frac{y}{x}\right)-x$ is

(A) $\log x-\cos\left(\frac{y}{x}\right)=c$

(B) $\log x+\cos\left(\frac{y}{x}\right)=c$

(C) $x-\cos\left(\frac{y}{x}\right)=c$

(D) $x+\cos\left(\frac{y}{x}\right)=c$

169. Solve the differential equation

$$x\frac{dy}{dx}-y=2\sqrt{y^2-x^2}.$$

(A) $y-\sqrt{x+y}=x+c$

(B) $y+\sqrt{y^2-x^2}=cx^3$

(C) $y+\sqrt{y-x}=cx^2$

(D) $y-\sqrt{y^2+x^2}=cx$

170. Solve the differential equation $(y+x)\frac{dy}{dx}=y-x$.

(A) $\frac{1}{2}\log\left(x^2+y^2\right)+\tan^{-1}\left(\frac{y}{x}\right)=c$

(B) $\log\left(x^2+y^2\right)+\tan^{-1}\left(\frac{y}{x}\right)=c$

(C) $\frac{1}{2}\log\left(x^2-y^2\right)-\tan^{-1}\left(\frac{y}{x}\right)=c$

(D) $\log\left(x^2-y^2\right)-\tan^{-1}\left(\frac{y}{x}\right)=c$

171. Integrating factor of the differential equation $(x^2+1)\frac{dy}{dx}+2xy=x^2-1$ is

(A) $\frac{x^2-1}{x^2+1}$ (B) $\frac{2x}{x^2+1}$
(C) x^2+1 (D) None of these

172. Integrating factor of the differential equation $\frac{dy}{dx}+\frac{1}{x}y=2x$ is

(A) x (B) $\log x$
(C) 0 (D) ∞

173. Integrating factor of the differential equation $\cos x\frac{dy}{dx}+y\sin x=1$ is

(A) $\cos x$ (B) $\tan x$
(C) $\sec x$ (D) $\sin x$

174. Integrating factor of the differential equation $\frac{dy}{dx}+2y=\frac{1-y}{x}$ is

(A) $\frac{x}{e^x}$ (B) $\frac{e^x}{x}$

(C) xe^{2x} (D) e^x

175. Integrating factor of the differential equation $xdy - ydx + x^2e^xdx = 0$ is

(A) 1/2 (B) $\log\sqrt{1+x^2}$

(C) $\sqrt{1+x^2}$ (D) x

176. Integrating factor of the differential equation $(1+x^2)\frac{dy}{dx}+xy=x$ is

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

(C) $\sqrt{1+x^2}$ (D) x

177. Integrating factor of the differential equation $(1-x^2)\frac{dy}{dx}-xy=1$ is

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

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

178. The integrating factor of the differential equation $\frac{dy}{dx}+\frac{y}{(1-x)\sqrt{x}}=1-\sqrt{x}$ is

(A) $\frac{1-\sqrt{x}}{1+\sqrt{x}}$ (B) $\frac{1+x}{1-x}$

(C) $\frac{1+\sqrt{x}}{1-\sqrt{x}}$ (D) $\frac{\sqrt{x}}{1-\sqrt{x}}$

179. The solution of $\frac{dy}{dx}+y=e^{-x}$, , $y(0) = 0$ is

(A) $y = e^x(x-1)$ (B) $y = xe^{-x}$

(C) $y = xe^{-x} + 1$ (D) $y = (x+1)e^{-x}$

180. Solve the differential equation $x\frac{dy}{dx}-y=x^2$.

(A) $y = x^2 + cx$ (B) $y = x + c$

(C) $y = x^2 - cx$ (D) $y = x - c$

181. The angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 4, respectively and $\vec{a}\cdot\vec{b}=2\sqrt{3}$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{2}$ (D) $\frac{5\pi}{2}$

182. If $\vec{a},\vec{b},\vec{c}$ are three non-zero vectors such that each one of them are perpendicular to the sum of the other two vectors, then the value of $|\vec{a}+\vec{b}+\vec{c}|^2$ is

(A) $|\vec{a}|^2+|\vec{b}|^2+|\vec{c}|^2$

(B) $|\vec{a}|+|\vec{b}|+|\vec{c}|$

(C) $2(|\vec{a}|^2+|\vec{b}|^2+|\vec{c}|^2)$

(D) $\frac{1}{2}(|\vec{a}|^2+|\vec{b}|^2+|\vec{c}|^2)$

183. If the sum of two unit vectors is a unit vector, then the magnitude of their difference is

(A) $\sqrt{2}$ units (B) 2 units

(C) $\sqrt{3}$ units (D) $\sqrt{5}$ units

184. If $|\vec{a}|=|\vec{b}|=1$ and $|\vec{a}+\vec{b}|=\sqrt{3}$, then the value of $(3\vec{a}-4\vec{b})\cdot(2\vec{a}+5\vec{b})$ is

(A) –21 (B) –21/2

(C) 21 (D) 21/2

185. $\vec{a}$, $\vec{b}$ and $\vec{c}$ are perpendicular to $\vec{b}+\vec{c}$, $\vec{c}+\vec{a}$ and $\vec{a}+\vec{b}$ respectively and if $|\vec{a}+\vec{b}|=6$, $|\vec{b}+\vec{c}|=8$ and $|\vec{c}+\vec{a}|=10$, then $|\vec{a}+\vec{b}+\vec{c}|$ is equal to

(A) $5\sqrt{2}$ (B) 50

(C) $10\sqrt{2}$ (D) 10

186. Let $\hat{a}$ and $\hat{b}$ be two unit vectors. If the vectors $\vec{c} = \hat{a} + 2\hat{b}$ and $\vec{d} = 5\hat{a} - 4\hat{b}$ are perpendicular to each other, then the angle between $\hat{a}$ and $\hat{b}$ is

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

187. If $\vec{a}$ and $\vec{b}$ -are two non-zero vectors, then $(\vec{a}+\vec{b})\cdot(\vec{a}-\vec{b})$ is equal to

(A) $\vec{a}+\vec{b}$ (B) $|\vec{a}-\vec{b}|^2$

(C) $|\vec{a}+\vec{b}|^2$ (D) $|\vec{a}|^2 - |\vec{b}|^2$

188. If $|\vec{a}-\vec{b}| = |\vec{a}| = |\vec{b}| = 1$, then the angle between $\vec{a}$ and $\vec{b}$ is

(A) $\frac{\pi}{3}$ (B) $\frac{3\pi}{4}$

(C) $\frac{\pi}{2}$ (D) 0

189. $\vec{a}, \vec{b}, \vec{c}$ are three vectors, such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, $|\vec{a}|=1$, $|\vec{b}|=2, |\vec{c}|=3$, then $\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$ is equal to

(A) 0 (B) –7

(C) 7 (D) 1

190. If $\vec{a}$ and $\vec{b}$ are two unit vectors inclined to x-axis at angle 30° and 120° respectively, then $|\vec{a}+\vec{b}|$ equals

(A) $\sqrt{\frac{2}{3}}$ (B) $\sqrt{2}$

(C) $\sqrt{3}$ (D) 2

191. If $|\vec{a}|=5$, $|\vec{b}|=4, |\vec{c}|=3$, then what will be the value of $|\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}|$, given that $\vec{a}+\vec{b}+\vec{c}=0$?

(A) 25 (B) 50

(C) –25 (D) –50

192. If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}|=7$, $|\vec{b}|=5$, $|\vec{c}|=3$ then angle between vector $\vec{b}$ and $\vec{c}$ is

(A) 60° (B) 30°

(C) 45° (D) 90°

193. If $\hat{i}, \hat{j}, \hat{k}$ are unit vectors along three mutually perpendicular directions, then

(A) $\hat{i}\cdot\hat{j}=1$ (B) $\hat{j}\cdot\hat{k}=1$

(C) $\hat{i}\cdot\hat{k}=0$ (D) $\hat{i}\cdot\hat{i}=0$

194. The length of longer diagonal of the parallelogram constructed on $5\vec{a}+2\vec{b}$ and $\vec{a}-3\vec{b}$, if it is given that $|\vec{a}|=2\sqrt{2}, |\vec{b}|=3$ and angle between $\vec{a}$ and $\vec{b}$ is $\pi/4$, is

(A) 15

(B) $\sqrt{113}$

(C) $\sqrt{593}$

(D) $\sqrt{369}$

195. If the projection of $\vec{a}=\hat{i}-2\hat{j}+3\hat{k}$ on $\vec{b}=2\hat{i}+\lambda\hat{k}$ is zero, then the value of λ is

(A) 0 (B) 1

(C) –2/3 (D) –3/2

196. Let $\vec{u}, \vec{v}, \vec{w}$ be such that $|\vec{u}|=1$, $|\vec{v}|=2$, $|\vec{\omega}|=3$.. If the projection of $\vec{v}$ along $\vec{u}$ is equal to that of $\vec{w}$ along $\vec{u}$ and $\vec{v}, \vec{\omega}$ are perpendicular to each other, then $|\vec{u}-\vec{v}+\vec{w}|$ equals

(A) $\sqrt{14}$ (B) $\sqrt{7}$

(C) 2 (D) 14

197. The angle between $\vec{a}$ and $\vec{b}$ and $\frac{5\pi}{6}$ and the projection of $\vec{a}$ on $\vec{b}$ is $\frac{-9}{\sqrt{3}}$, then $|\vec{a}|$ is equal to

(A) 12 (B) 8

(C) 10 (D) 6

198. For any vector $\vec{x}$ the value of $(\vec{x}\times\hat{i})^2+(\vec{x}\times\hat{j})^2+(\vec{x}\times\hat{k})^2$ is equal to

(A) $|\vec{x}|^2$
(B) $2|\vec{x}|^2$
(C) $3|\vec{x}|^2$
(D) $4|\vec{x}|^2$

199. If $\vec{a}=2\hat{i}+\hat{k}$, $\vec{b}=\hat{i}+\hat{j}+\hat{k}$, $\vec{c}=4\hat{i}-3\hat{j}+7\hat{k}$, then the vector $\vec{r}$ satisfying $\vec{r}\times\vec{b}=\vec{c}\times\vec{b}$ and $\vec{r}\cdot\vec{a}=0$ is

(A) $\hat{i}+8\hat{j}+2\hat{k}$
(B) $\hat{i}-8\hat{j}+2\hat{k}$
(C) $\hat{i}-8\hat{j}-2\hat{k}$
(D) $-\hat{i}-8\hat{j}+2\hat{k}$

200. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three unit vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$. If $\lambda=\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}$ and $\vec{d}=\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}$ then the order pair $(\lambda,\vec{d})$ is equal to

(A) $\left(\frac{3}{2},\ 3(\vec{b}\times\vec{c})\right)$
(B) $\left(\frac{3}{2}, 3(\vec{a}\times\vec{c})\right)$
(C) $\left(-\frac{3}{2}, 3(\vec{a}\times\vec{b})\right)$
(D) $\left(-\frac{3}{2}, 3(\vec{c}\times\vec{b})\right)$

Answer Key

1.	(A)	27.	(B)	53.	(D)
2.	(A)	28.	(C)	54.	(D)
3.	(D)	29.	(B)	55.	(D)
4.	(A)	30.	(D)	56.	(B)
5.	(B)	31.	(B)	57.	(D)
6.	(A)	32.	(B)	58.	(C)
7.	(D)	33.	(B)	59.	(C)
8.	(B)	34.	(C)	60.	(D)
9.	(D)	35.	(C)	61.	(A)
10.	(A)	36.	(A)	62.	(B)
11.	(A)	37.	(B)	63.	(D)
12.	(C)	38.	(A)	64.	(D)
13.	(D)	39.	(C)	65.	(A)
14.	(A)	40.	(B)	66.	(C)
15.	(D)	41.	(B)	67.	(D)
16.	(C)	42.	(B)	68.	(B)
17.	(B)	43.	(B)	69.	(B)
18.	(C)	44.	(D)	70.	(B)
19.	(D)	45.	(A)	71.	(C)
20.	(A)	46.	(D)	72.	(B)
21.	(D)	47.	(D)	73.	(A)
22.	(B)	48.	(D)	74.	(A)
23.	(D)	49.	(A)	75.	(B)
24.	(B)	50.	(D)	76.	(A)
25.	(B)	51.	(C)	77.	(B)
26.	(A)	52.	(D)	78.	(B)

79. (C)
80. (A)
81. (D)
82. (D)
83. (A)
84. (D)
85. (C)
86. (B)
87. (B)
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199. (D)
200. (C)