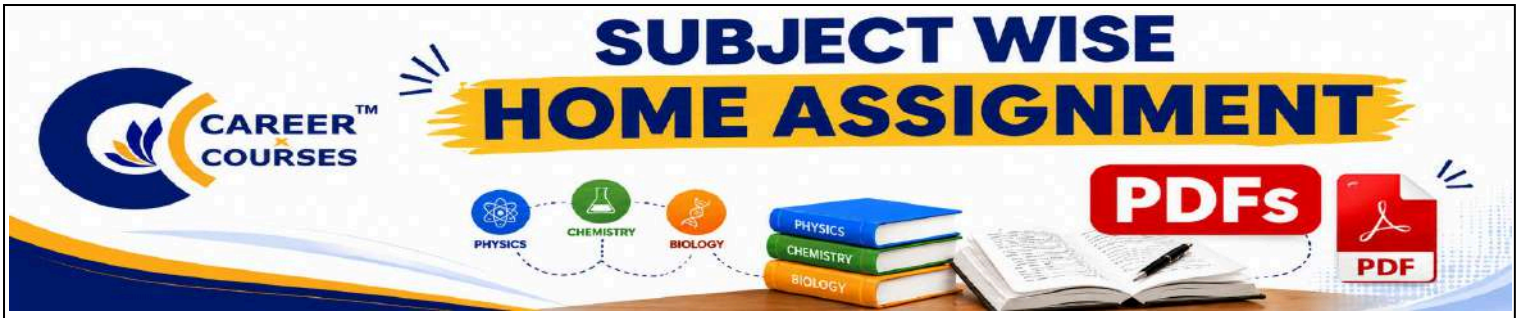


Career and Courses

Subjects : Maths | **JEE MAINS MATHEMATICS** | **Date** : 10-11-2026

Total Marks : 600 | **Hours** : 3 Hours

Maths - Section A (MCQ)

1. If the domain of the function $\sin^{-1}\left(\frac{3x-22}{2x-19}\right)+\log_e\left(\frac{3x^2-8x+5}{x^2-3x-10}\right)$ is $(\alpha,\beta]$, then $3\alpha+10\beta$ is equal to :

   A) 97 B) 100 C) 95 D) 98

2. The range of the function $f(x)=\sqrt{3-x}+\sqrt{2+x}$ is

   A) $[\sqrt{5},\sqrt{10}]$ B) $[2\sqrt{2},\sqrt{11}]$ C) $[\sqrt{5},\sqrt{13}]$ D) $[\sqrt{2},\sqrt{7}]$

3. Let the domains of the functions
   $f(x)=\log_4\log_3\log_7\left(8-\log_2\left(x^2+4x+5\right)\right)$ and $g(x)=\sin^{-1}\left(\frac{7x+10}{x-2}\right)$ be (α,β) and $[\gamma,\delta]$, respectively. Then $\alpha^2+\beta^2+\gamma^2+\delta^2$ is equal to :-

   A) 15 B) 13 C) 16 D) 14

4. The absolute minimum value, of the function $f(x)=\left|x^2-x+1\right|+\left[x^2-x+1\right]$, where $[t]$ denotes the greatest integer function, in the interval $[-1,2]$, is :

   A) $\frac{3}{4}$ B) $\frac{3}{2}$ C) $\frac{1}{4}$ D) $\frac{5}{4}$

5. The value of $\text{cosec}10^\circ-\sqrt{3}\sec10^\circ$ is equal to:

   A) 4 B) 2 C) 8 D) 6

6. If $\sin\left(\frac{\pi}{18}\right)\sin\left(\frac{5\pi}{18}\right)\sin\left(\frac{7\pi}{18}\right)=K$, then the value of $\sin\left(\frac{10K\pi}{3}\right)$ is :

   A) $\frac{\sqrt{3}+1}{2\sqrt{2}}$ B) $\frac{\sqrt{3}-1}{\sqrt{2}}$ C) $\frac{\sqrt{3}}{2}$ D) $\frac{1}{2}$

7. The least value of $(cos^2\theta-6sin\theta\ cos\theta+3\ sin^2\theta+2)$ is:

   A) -1 B) $4+\sqrt{10}$ C) $4-\sqrt{10}$ D) 1

8. If the value of $\frac{3\cos36^\circ+5\sin18^\circ}{5\cos36^\circ-3\sin18^\circ}$ is $\frac{a\sqrt{5}-b}{c}$ where a, b, c are natural numbers and $\gcd(a,c)=1$, then $a+b+c$ is equal to :

   A) 50 B) 40 C) 52 D) 54

9. Let $S_1=\left\{z_1\in C:|z_1-3|=\frac{1}{2}\right\}$ and $S_2=\{z_2\in C:|z_2-|z_2+1||=|z_2+|z_2-1||\}$. Then, for $z_1\in S_1$ and $z_2\in S_2$, the least value of $|z_2-z_1|$ is.

   A) 0 B) $\frac{1}{2}$ C) $\frac{3}{2}$ D) $\frac{5}{2}$

10. If z is a complex number such that $|z|\geq2$, then the minimum value of $\left|z+\frac{1}{2}\right|$:

    A) is strictly greater than $\frac{5}{2}$ B) is strictly greater than $\frac{3}{2}$ but less than $\frac{5}{2}$

C) is equal to $\frac{5}{2}$ D) lie in the interval $(1, 2)$

11. Let $A = \{z \in C : 1 \leq 1z - (1 + i) \leq 2\}$ and $B = \{z \in A : |z - (1 - i)| = 1\}$. Then, B

A) is an empty set B) contains exactly two elements

C) contains exactly three elements D) is an infinite set

12. Let the set of all values of $k \in \mathbb{R}$ such that the equation $z(\bar{z} + 2 + i) + k(2 + 3i) = 0$, $z \in \mathbb{C}$, has at least one solution, be the interval $[\alpha, \beta]$. Then $9(\alpha + \beta)$ is equal to:

A) -10 B) -8 C) $10\sqrt{13}$ D) $8\sqrt{13}$

13. Let the set of all values of $\mathrm{p} \in \mathbb{R}$, for which both the roots of the equation $x^2 - (p + 2)x + (2p + 9) = 0$ are negative real numbers, be the interval $(\alpha, \beta]$. Then $\beta - 2\alpha$ is equal to

A) 0 B) 9 C) 5 D) 20

14. If α and β are the roots of the equation $2x(2x + 1) = 1$, then β is equal to

A) $2\alpha^2$ B) $2\alpha(\alpha + 1)$ C) $-2\alpha(\alpha + 1)$ D) $2\alpha(\alpha - 1)$

15. The sum of all the real roots of the equation $\left(e^{2x} - 4\right)\left(6e^{2x} - 5e^{x} + 1\right) = 0$ is

A) $\log_c 3$ B) $-\log_e 3$ C) $\log_e 6$ D) $-\log_e 6$

16. If $a \in R$ and the equation $-3(x - [x])^2 + 2(x - [x]) + a^2 = 0$ (where $[x]$ denotes the greatest integer $\leq x$)has no integral solution ,then all possible values of a lie in the interval

A) $(-1, 0) \cup (0, 1)$ B) $(1, 2)$ C) $(-2, -1)$ D) $(-\infty, -2) \cup (2, \infty)$

17. Number of ways of arranging 8 identical books into 4 identical shelves where any number of shelves may remain empty is equal to

A) 18 B) 16 C) 12 D) 15

18. Two families with three members each and one family with four members are to be seated in a row. In how many ways can they be seated so that the same family members are not separated ?

A) 2!3!4! B) $(3!)^3 \cdot (4!)$ C) $(3!)^2 \cdot (4!)$ D) $3!(4!)^3$

19. The number of ways five alphabets can be chosen from the alphabets of the word $MATHEMATICS$, where the chosen alphabets are not necessarily distinct, is equal to :

A) 175 B) 181 C) 177 D) 179

20. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

A) 165 B) 155 C) 145 D) 135

21. The coefficient of x^{1012} in the expansion of $\left(1 + x^n + x^{253}\right)^{10}$, (where $n \leq 22$ is any positive integer), is

A) 1 B) ${}^{10}C_4$ C) $4n$ D) ${}^{253}C_4$

22. The term independent of x in the expansion of $\left(\frac{(x+1)}{(x^{2/3}+1-x^{1/3})} - \frac{(x+1)}{(x-x^{1/2})}\right)^{10}$, $x > 1$ is:

A) 210 B) 150 C) 240 D) 120

23. If $\sum_{r=0}^{25} \left\{{}^{50}C_r \cdot {}^{50-r}C_{25-r}\right\} = K\left({}^{50}C_{25}\right)$, then K is equal to

A) $(25)^2$ B) $2^{25} - 1$ C) 2^{24} D) 2^{25}

24. The coefficient of x^{301} in $(1 + x)^{500} + x(1 + x)^{499} + x^2(1 + x)^{498} + \ldots\ldots + x^{500}$ is:

A) ${}^{501}C_{302}$ B) ${}^{500}C_{301}$ C) ${}^{500}C_{300}$ D) ${}^{501}C_{200}$

25. The first term of an A.P. of 30 non-negative terms is $\frac{10}{3}$. If the sum of this A.P. is the cube of its last term, then its common difference is:

A) $\frac{5}{87}$ B) $\frac{25}{83}$ C) $\frac{15}{29}$ D) $\frac{5}{29}$

26. Let $\langle a_n \rangle$ be a sequence such that $a_0 = 0, a_1 = \frac{1}{2}$ and $2a_{n+2} = 5a_{n+1} - 3a_n, n = 0, 1, 2, 3, ...$ Then $\sum_{k=1}^{100} a_k$ is equal to

A) $3a_{99} - 100$ B) $3a_{100} - 100$ C) $3a_{99} + 100$ D) $3a_{100} + 100$

27. Three numbers are in an increasing geometric progression with common ratio r. If the middle number is doubled, then the new numbers are in an arithmetic progression with common difference d. If the fourth term of GP is $3r^2$, then $r^2 - d$ is equal to:

A) $7 - 7\sqrt{3}$ B) $7 + \sqrt{3}$ C) $7 - \sqrt{3}$ D) $7 + 3\sqrt{3}$

28. The sum $1 + \frac{1}{2}(1^2 + 2^2) + \frac{1}{3}(1^2 + 2^2 + 3^2) + ...$ upto 10 terms is equal to :

A) 130 B) 155 C) $\frac{315}{2}$ D) $\frac{325}{2}$

29. The set of all possible values of θ in the interval $(0, \pi)$ for which the points $(1, 2)$ and $(\sin\theta, \cos\theta)$ lie on the same side of the line $x + y = 1$ is

A) $(0, \frac{\pi}{4})$ B) $(0, \frac{3\pi}{4})$ C) $(\frac{\pi}{4}, \frac{3\pi}{4})$ D) $(0, \frac{\pi}{2})$

30. Let B and C be the two points on the line $y + x = 0$ such that B and C are symmetric with respect to the origin. Suppose A is a point on $y - 2x = 2$ such that $\triangle ABC$ is an equilateral triangle. Then, the area of the $\triangle ABC$ is

A) $3\sqrt{3}$ B) $2\sqrt{3}$ C) $\frac{8}{\sqrt{3}}$ D) $\frac{10}{\sqrt{3}}$

31. If in a parallelogram $ABDC$, the coordinates of A, B and C are respectively $(1, 2), (3, 4)$ and $(2, 5)$, then the equation of the diagonal AD is

A) $5x - 3y + 1 = 0$ B) $5x + 3y - 11 = 0$ C) $3x - 5y + 7 = 0$ D) $3x + 5y - 13 = 0$

32. Let ABC be a triangle with $A(-3, 1)$ and $\angle ACB = \theta, 0 < \theta < \frac{\pi}{2}$. If the equation of the median through B is $2x + y - 3 = 0$ and the equation of angle bisector of C is $7x - 4y - 1 = 0$ then $\tan\theta$ is equal to:

A) $\frac{1}{2}$ B) $\frac{3}{4}$ C) $\frac{4}{3}$ D) 2

33. The points of intersection of the line $ax + by = 0, (a \neq b)$ and the circle $x^2 + y^2 - 2x = 0$ are $A(\alpha, 0)$ and $B(1, \beta)$. The image of the circle with AB as a diameter in the line $x + y + 2 = 0$ is:

A) $x^2 + y^2 + 5x + 5y + 12 = 0$ B) $x^2 + y^2 + 3x + 5y + 8 = 0$

C) $x^2 + y^2 + 3x + 3y + 4 = 0$ D) $x^2 + y^2 - 5x - 5y + 12 = 0$

34. If a circle of radius R passes through the origin O and intersects the coordinate axes at A and B, then the locus of the foot of perpendicular from O on AB is

A) $(x^2 + y^2)^2 = 4R^2x^2y^2$ B) $(x^2 + y^2)^3 = 4R^2x^2y^2$ C) $(x^2 + y^2)^2 = 4Rx^2y^2$ D) $(x^2 + y^2)(x + y) = R^2xy$

35. Let C be a circle passing through the points $A(2, -1)$ and $B(3, 4)$. The line segment AB is not a diameter of C. If r is the radius of C and its centre lies on the circle $(x - 5)^2 + (y - 1)^2 = \frac{13}{2}$, then r^2 is equal to

A) 32 B) $\frac{65}{2}$ C) $\frac{61}{2}$ D) 30

36. Let A be the point $(1, 2)$ and B be any point on the curve $x^2 + y^2 = 16$. If the centre of the locus of the point P, which divides the line segment AB in the ratio $3 : 2$ is the point $C(\alpha, \beta)$, then the length of the line segment AC is

A) $\frac{6\sqrt{5}}{5}$ B) $\frac{4\sqrt{5}}{5}$ C) $\frac{2\sqrt{5}}{5}$ D) $\frac{3\sqrt{5}}{5}$

37. If θ denotes the acute angle between the curves, $y = 10 - x^2$ and $y = 2 + x^2$ at a point of their intersection, then $|\tan\theta|$ is equal to

A) $\frac{4}{9}$ B) $\frac{8}{15}$ C) $\frac{7}{17}$ D) $\frac{8}{17}$

38. The equations of two sides of a variable triangle are $x = 0$ and $y = 3$, and its third side is a tangent to the parabola $y^2 = 6x$. The locus of its circumcentre is :

A) $4y^2 - 18y - 3x - 18 = 0$ B) $4y^2 + 18y + 3x + 18 = 0$

C) $4y^2 - 18y + 3x + 18 = 0$ D) $4y^2 - 18y - 3x + 18 = 0$

39. Let p be the number of all triangles that can be formed by joining the vertices of a regular polygon P of n sides and q be the number of all quadrilaterals that can be formed by joining the vertices of P. If $p + q = 126$, then the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{n} = 1$ is :

A) $\frac{3}{4}$ B) $\frac{1}{2}$ C) $\frac{\sqrt{7}}{4}$ D) $\frac{1}{\sqrt{2}}$

40. Let the eccentricity e of a hyperbola satisfy the equation $6e^2 - 11e + 3 = 0$. If the foci of the hyperbola are $(3, 5)$ and $(3, -4)$, then the length of its latus rectum is :

A) $\frac{11}{3}$ B) $\frac{17}{3}$ C) $\frac{15}{2}$ D) $\frac{17}{2}$

41. The square of the distance of the point $(-2, -8, 6)$ from the line $\frac{x-1}{1} = \frac{y-1}{2} = \frac{z}{-1}$ along the line $\frac{x+5}{1} = \frac{y+5}{-1} = \frac{z}{2}$ is equal to:

A) 3 B) 6 C) 8 D) 12

42. Let $\mathrm{P(x, y, z)}$ be a point in the first octant, whose projection in the xy-plane is the point Q. Let $\mathrm{OP} = \gamma$; the angle between OQ and the positive x-axis be θ; and the angle between OP and the positive z-axis be ϕ, where O is the origin. Then the distance of P from the x-axis is :

A) $\gamma\sqrt{1 - \sin^2\phi\cos^2\theta}$ B) $\gamma\sqrt{1 + \cos^2\theta\sin^2\phi}$ C) $\gamma\sqrt{1 - \sin^2\theta\cos^2\phi}$ D) $\gamma\sqrt{1 + \cos^2\phi\sin^2\theta}$

43. The square of the distance of the point $P(5, 6, 7)$ from the line $\frac{x-2}{2} = \frac{y-5}{3} = \frac{z-2}{4}$ is equal to:

A) 3 B) 5 C) 6 D) 8

44. Let the point A be the foot of perpendicular drawn from the point $P(a, b, 0)$ on the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-\alpha}{3}$. If the midpoint of the line segment PA is $\left(0, \frac{3}{4}, \frac{-1}{4}\right)$, then the value of $a^2 + b^2 + \alpha^2$ is equal to:

A) 1 B) 2 C) 6 D) 9

45. $\lim_{x\to 0} \frac{e^{2|\sin x|} - 2|\sin x| - 1}{x^2}$

A) is equal to -1 B) does not exist C) is equal to 1 D) is equal to 2

46. If $\lim_{x\to 0} \frac{3 + \alpha\sin x + \beta\cos x + \log_e(1-x)}{3\tan^2 x} = \frac{1}{3}$, then $2\alpha - \beta$ is equal to :

A) 2 B) 7 C) 5 D) 1

47. Let $[t]$ denote the greatest integer $\leq t$ and $\lim\limits_{x\to 0} x\left[\frac{4}{x}\right] = A$. Then the function. $\mathrm{f(x)} = \left[\mathrm{x}^2\right]\sin(\pi \mathrm{x})$ is discontinuous, when x is equal to

A) $\sqrt{A+5}$ B) $\sqrt{A+1}$ C) $\sqrt{A}$ D) $\sqrt{A+21}$

48. $\lim_{x\to\frac{\pi}{2}}\left(\frac{\int_{x^3}^{(\pi/2)^3}(\sin(2t^{1/3})+\cos(t^{1/3}))dt}{(x-\frac{\pi}{2})^2}\right)$ is equal to:

A) $\frac{9\pi^2}{8}$ B) $\frac{11\pi^2}{10}$ C) $\frac{3\pi^2}{2}$ D) $\frac{5\pi^2}{9}$

49. Let the mean and variance of 8 numbers -10, -7, -1, x, y, 9, 2, 16 be $\frac{7}{2}$ and $\frac{293}{4}$ respectively. Then the mean of 4 numbers x, y, $x+y+1$, $|x-y|$ is:

A) 11 B) 9 C) 10 D) 12

50. The mean deviation about the mean for the data

x_i	5	7	9	10	12	15
f_i	8	6	2	2	2	6

is equal to:

A) $\frac{40}{13}$ B) $\frac{42}{13}$ C) $\frac{44}{13}$ D) $\frac{46}{13}$

51. Let the mean and the variance of 6 observation a, b, $68, 44, 48, 60$ be 55 and 194, respectively if $a > b$, then $a+3b$ is

A) 200 B) 190 C) 180 D) 210

52. The mean and standard deviation of 20 observations were calculated as 10 and 2.5 respectively. It was found that by mistake one data value was taken as 25 instead of 35. If α and $\sqrt{\beta}$ are the mean and standard deviation respectively for correct data, then (α, β) is :

A) $(11, 26)$ B) $(10.5, 25)$ C) $(11, 25)$ D) $(10.5, 26)$

53. Out of 60% female and 40% male candidates appearing in an exam, 60% candidates qualify it. The number of females qualifying the exam is twice the number of males qualifying it. A candidate is randomly chosen from the qualified candidates. The probability, that the chosen candidate is a female, is.

A) $\frac{13}{16}$ B) $\frac{11}{16}$ C) $\frac{23}{32}$ D) $\frac{2}{3}$

54. Let $A = [a_{ij}]$ be a square matrix of order 2 with entries either 0 or 1 . Let E be the event that A is an invertible matrix. Then the probability $\mathrm{P(E)}$ is :

A) $\frac{3}{16}$ B) $\frac{5}{8}$ C) $\frac{3}{8}$ D) $\frac{1}{8}$

55. The probability that two randomly selected subsets of the set $\{1, 2, 3, 4, 5\}$ have exactly two elements in their intersection, is :

A) $\frac{65}{2^7}$ B) $\frac{65}{2^8}$ C) $\frac{135}{2^9}$ D) $\frac{35}{2^7}$

56. The sum $\sum\limits_{n=1}^{\infty}\frac{2n^2+3n+4}{(2n)!}$ is equal to :

A) $\frac{11e}{2}+\frac{7}{2e}$ B) $\frac{13e}{4}+\frac{5}{4e}-4$ C) $\frac{11e}{2}+\frac{7}{2e}-4$ D) $\frac{13e}{4}+\frac{5}{4e}$

57. The coefficient of x^5 in the expansion of $\frac{x^2+1}{(x^2+4)(x-2)}$ is

A) $1/256$ B) $1/562$ C) $1/265$ D) $-1/256$

58. Let the vertex A of a triangle ABC be $(1, 2)$, and the mid-point of the side AB be $(5, -1)$. If the centroid of this triangle is $(3, 4)$ and its circumcenter is (α, β), then $21(\alpha+\beta)$ is equal to:

A) 309 B) 403 C) 497 D) 524

59. Let $(5, \frac{a}{4})$, be the circumcenter of a triangle with vertices $A(a,-2), B(a,6)$ and $C\left(\frac{a}{4},-2\right)$. Let α denote the circumradius, β denote the area and γ denote the perimeter of the triangle. Then $\alpha+\beta+\gamma$ is .....

A) 60 B) 53 C) 62 D) 30

60. Let,$S=\left\{\theta \in [0,2\pi] : 8^{2\sin^2\theta}+8^{2\cos^2\theta}=16\right\}$. Then $n(S)+\sum_{\theta\in S}\left(\sec\left(\frac{\pi}{4}+2\theta\right)\operatorname{cosec}\left(\frac{\pi}{4}+2\theta\right)\right)$ is equal to.

A) 0 B) -2 C) -4 D) 12

61. If the lengths of the sides of a triangle are in $A.P.$ and the greatest angle is double the smallest, then a ratio of lengths of the sides of this triangle

A) 4 : 5 : 6 B) 5 : 6 : 7 C) 3 : 4 : 5 D) 5 : 9 : 13

62. The angle of elevation of a jet plane from a point A on the ground is 60°. After a flight of 20 $seconds$ at the speed of 432 $km/hour$, the angle of elevation changes to 30°. If the jet plane is flying at a constant height, then its height is ..... m.

A) $1800\sqrt{3}$ B) $3600\sqrt{3}$ C) $2400\sqrt{3}$ D) $1200\sqrt{3}$

63. Let $A=\{-3,-2,-1,0,1,2,3,\}.LetR$ be a relation on A defined by xRy if and only if $0\le x^2+2y\le 4$. Let l be the number of elements in R and m be the minimum number of elements required to be added in R to make it a reflexive relation. then $l+m$ is equal to

A) 19 B) 20 C) 17 D) 18

64. Let $f(x)=\frac{x-1}{x+1}, x\in R-\{0,-1,1)$. If $f^{a+1}(x)=f\left(f^n(x)\right)$ for all $n\in N$, then $f'(6)+f(7)$ is equal to

A) $\frac{7}{6}$ B) $-\frac{3}{2}$ C) $\frac{7}{12}$ D) $-\frac{11}{12}$

65. Let $f(x)=\log_e x$ and $g(x)=\frac{x^4-2x^3+3x^2-2x+2}{2x^2-2x+1}$. Then the domain of $f\circ g$ is

A) $[0,\infty)$ B) $[1,\infty)$ C) $(0,\infty)$ D) $\mathbb{R}$

66. The value of $\tan\left(2\tan^{-1}\left(\frac{3}{5}\right)+\sin^{-1}\left(\frac{5}{13}\right)\right)$ is equal to:

A) $\frac{-291}{76}$ B) $\frac{-181}{69}$ C) $\frac{151}{63}$ D) $\frac{220}{21}$

67. Considering the principal values of inverse trigonometric functions, the value of the expression $\tan\left(2\sin^{-1}\left(\frac{2}{\sqrt{13}}\right)-2\cos^{-1}\left(\frac{3}{\sqrt{10}}\right)\right)$ is equal to:

A) $-\frac{33}{56}$ B) $\frac{33}{56}$ C) $\frac{16}{63}$ D) $-\frac{16}{63}$

68. If $\sin(\tan^{-1}(x\sqrt{2}))=\cot(\sin^{-1}\sqrt{1-x^2})$, $x\in(0,1)$, then the value of x is :

A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{5}{8}$

69. The matrix $A^2+4A-5I$, where I is identity matrix and $A=\begin{bmatrix}1&2\\4&-3\end{bmatrix}$, equals

A) $4\begin{bmatrix}2&1\\2&0\end{bmatrix}$ B) $4\begin{bmatrix}0&-1\\2&2\end{bmatrix}$ C) $32\begin{bmatrix}2&1\\2&0\end{bmatrix}$ D) $32\begin{bmatrix}1&1\\1&0\end{bmatrix}$

70. If the following system of linear equations
$2x+y+z=5$
$x-y+z=3$
$x+y+az=b$
has no solution, then :

A) $a=-\frac{1}{3},\ b\neq\frac{7}{3}$ B) $a\neq\frac{1}{3}, b=\frac{7}{3}$ C) $a\neq-\frac{1}{3},\ b=\frac{7}{3}$ D) $a=\frac{1}{3},\ b\neq\frac{7}{3}$

71. Let $A=\begin{bmatrix}\alpha & 1 & 2\\ 2 & 3 & 0\\ 0 & 4 & 5\end{bmatrix}$ and $B=\begin{bmatrix}1 & 0 & 0\\ 0 & -5\alpha & 0\\ 0 & 4\alpha & -2\alpha\end{bmatrix}+\text{adj}(A)$. If $\det(B)=66$, then $\det(\text{adj}(A))$ equals:

A) 289 B) 361 C) 441 D) 529

72. If the function $f(x)=\begin{cases} a\,|\pi-x|+1, & x\le 5\\ b\,|\pi-x|+3, & x>5\end{cases}$ is continuous at $x=5$, then the value of $a-b$ is

A) $\frac{2}{5-\pi}$ B) $\frac{2}{\pi-5}$ C) $\frac{2}{\pi+5}$ D) $\frac{-2}{\pi+5}$

73. Let $f:R\to R$ be differentiable at $c\in R$ and $f(c)=0$. If $g(x)=|f(x)|$, then at $x=c$, g is

A) differentiable if $f'(c)=0$ B) differentiable if $f'(c)\neq 0$

C) not differentiable D) not differentiable if $f'(c)=0$

74. If $y=\tan^{-1}\left(\sec x^3-\tan x^3\right)\cdot\frac{\pi}{2}<x^3<\frac{3\pi}{2}$, then

A) $xy''+2y'=0$ B) $x^2y''-6y+\frac{3\pi}{2}=0$ C) $x^2y''-6y+3\pi=0$ D) $xy''-4y'=0$

75. Let $f:R\to R$ be defined as
$f(\text{x})=\begin{matrix}-\frac{4}{3}x^3+2x^2+3x, & x>0\\ 3xe^x, & \text{x}\le 0\end{matrix}$
Then f is increasing function in the interval.

A) $\left(-1,\frac{3}{2}\right)$ B) $\left(\frac{-1}{2},2\right)$ C) $(0,2)$ D) $(-3,-1)$

76. Let $f(x)=\sin^4 x+\cos^4 x$. Then f is an increasing function in the interval

A) $\left[\frac{5\pi}{8},\frac{3\pi}{4}\right]$ B) $\left[\frac{\pi}{2},\frac{5\pi}{8}\right]$ C) $\left[\frac{\pi}{4},\frac{\pi}{2}\right]$ D) $\left[0,\frac{\pi}{4}\right]$

77. The volume of the largest possible right circular cylinder that can be inscribed in a sphere of radius $=\sqrt{3}$ is

A) $\frac{4}{3}\sqrt{3}\pi$ B) $\frac{8}{3}\sqrt{3}\pi$ C) 4π D) 2π

78. If $\int\frac{\tan x}{1+\tan x+\tan^2 x}dx=x-\frac{K}{\sqrt{A}}\tan^{-1}\left(\frac{K\tan x+1}{\sqrt{A}}\right)+C$, ($C$ is a constant ofintegration), then the ordered pair (K,A) is euqal to

A) $(2,3)$ B) $(2,1)$ C) $(-2,1)$ D) $(-2,3)$

79. Let $I(x)=\int\frac{3dx}{(4x+6)(\sqrt{4x^2+8x+3})}$ and $I(0)=\frac{\sqrt{3}}{4}+20$. If $I(\frac{1}{2})=\frac{a\sqrt{2}}{b}+c$, where $a,b,c\in N$ and $gcd(a,b)=1$, then $a+b+c$ is equal to:

A) 29 B) 28 C) 31 D) 30

80. For $I(x)=\int\frac{\sec^2 x-2022}{\sin^{2022}x}dx$, if $I\left(\frac{\pi}{4}\right)=2^{1011}$, then

A) $3^{1010}I\left(\frac{\pi}{3}\right)-I\left(\frac{\pi}{6}\right)=0$ B) $3^{1010}I\left(\frac{\pi}{6}\right)-I\left(\frac{\pi}{3}\right)=0$ C) $3^{1011}I\left(\frac{\pi}{3}\right)-I\left(\frac{\pi}{6}\right)=0$ D) $3^{1011}I\left(\frac{\pi}{6}\right)-I\left(\frac{\pi}{3}\right)=0$

81. Let $[\cdot]$ denote the greatest integer function. Then the value of $\int_0^3\left(\frac{e^x+e^{-x}}{[x]!}\right)dx$ is :

A) $e^2+e^3-\frac{1}{e^2}-\frac{1}{e^3}$

B) $\frac{1}{2}\left(e^2+e^3-\frac{1}{e^2}-\frac{1}{e^3}\right)$

C) $e^2+e^3-\frac{1}{2e^2}-\frac{1}{2e^3}$

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

82. Let $[t]$ denote the greatest integer less than or equal to t. Then the value of the integral $\int_{-3}^{101}\left([\sin(\pi x)]+e^{[\cos(2\pi x)]}\right)dx$ is equal to

A) $\frac{52(1-e)}{e}$ B) $\frac{52}{e}$ C) $\frac{52(2+e)}{e}$ D) $\frac{104}{e}$

83. Let $f:(-1,1)\to R$ be a continuous function. If $\int_0^{\sin x} f(t)\,dt=\frac{\sqrt{3}}{2}x$, then $f\left(\frac{\sqrt{3}}{2}\right)$ is equal to

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\sqrt{\frac{3}{2}}$ D) $\sqrt{3}$

84. The area of the region, inside the circle $(x-2\sqrt{3})^2+y^2=12$ and outside the parabola $y^2=2\sqrt{3}x$ is :

A) $3\pi+8$ B) $6\pi-16$ C) $3\pi-8$ D) $6\pi-8$

85. The area of the region $\left\{(x,y):|x-1|\le y\le\sqrt{5-x^2}\right\}$ is equal to.

A) $\frac{5}{2}\sin^{-1}\left(\frac{3}{5}\right)-\frac{1}{2}$ B) $\frac{5\pi}{4}-\frac{3}{2}$ C) $\frac{3\pi}{4}+\frac{3}{2}$ D) $\frac{5\pi}{4}-\frac{1}{2}$

86. If the area enclosed between the curves $y=kx^2$ and $x=ky^2,(k>0)$, is 1 square unit. Then k is

A) $\frac{\sqrt{3}}{2}$ B) $\frac{1}{\sqrt{3}}$ C) $\sqrt{3}$ D) $\frac{2}{\sqrt{3}}$

87. Let $x=x(y)$ be the solution of the differential equation $2(y+2)\log_e(y+2)dx+(x+4-2\log_e(y+2))\,dy=0$, $y>-1$ with $x\left(e^4-2\right)=1$. Then $x\left(e^9-2\right)$ is equal to

A) $\frac{4}{9}$ B) $\frac{10}{3}$ C) $\frac{32}{9}$ D) 3

88. Let $y=y(x)$ be the solution of the differential equation $\left(1+x^2\right)\frac{dy}{dx}+y=e^{\tan^{-1}x}, y(1)=0$. Then $\mathrm{y}(0)$ is

A) $\frac{1}{4}\left(\mathrm{e}^{\pi/2}-1\right)$ B) $\frac{1}{2}\left(1-\mathrm{e}^{\pi/2}\right)$ C) $\frac{1}{4}\left(1-\mathrm{e}^{\pi/2}\right)$ D) $\frac{1}{2}\left(\mathrm{e}^{\pi/2}-1\right)$

89. If $x=f(y)$ is the solution of the differential equation
$(1+y^2)+\left(x-2\mathrm{e}^{\tan^{-1}y}\right)\frac{\mathrm{d}y}{\mathrm{d}x}=0, y\in\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$
with $f(0)=1$, then $f\left(\frac{1}{\sqrt{3}}\right)$ is equal to :

A) $e^{\pi/12}$ B) $e^{\pi/4}$ C) $e^{\pi/3}$ D) $e^{\pi/6}$

90. The vector $\vec{a}=-\hat{i}+2\hat{j}+\hat{k}$ is rotated through a right angle, passing through the y-axis in its way and the resulting vector is $\vec{b}$. Then the projection of $3\vec{a}+\sqrt{2}\vec{b}$ on $\vec{c}=5\hat{i}+4\hat{j}+3\hat{k}$ is

A) $3\sqrt{2}$ B) 1 C) $\sqrt{6}$ D) $2\sqrt{3}$

91. Let $\overrightarrow{\mathrm{a}}=2\hat{\mathrm{i}}+\alpha\hat{\mathrm{j}}+\hat{\mathrm{k}}$, $\overrightarrow{\mathrm{b}}=-\hat{\mathrm{i}}+\hat{\mathrm{k}}$, $\overrightarrow{\mathrm{c}}=\beta\hat{\mathrm{j}}-\hat{\mathrm{k}}$, where α and β are integers and $\alpha\beta=-6$. Let the values of the ordered pair (α,β) for which the area of the parallelogram of diagonals $\vec{a}+\vec{b}$ and $\vec{b}+\vec{c}$ is $\frac{\sqrt{21}}{2}$, be (α_1,β_1) and (α_2,β_2). Then $\alpha_1^2+\beta_1^2-\alpha_2\beta_2$ is equal to

A) 17 B) 24 C) 21 D) 19

92. Between the following two statements :

Statement $-I$: Let $\overrightarrow{\mathrm{a}}=\hat{\mathrm{i}}+2\hat{\mathrm{j}}-3\hat{\mathrm{k}}$ and $\vec{b}=2\hat{i}+\hat{j}-\hat{k}$. Then the vector $\vec{r}$ satisfying $\overrightarrow{\mathrm{a}}\times\overrightarrow{\mathrm{r}}=\overrightarrow{\mathrm{a}}\times\overrightarrow{\mathrm{b}}$ and $\overrightarrow{\mathrm{a}}\cdot\overrightarrow{\mathrm{r}}=0$ is of magnitude $\sqrt{10}$.
Statement $-II$: In a triangle ABC, $\cos 2A+\cos 2B+\cos 2\mathrm{C}\ge-\frac{3}{2}$

A) Both Statement $-I$ and Statement $-II$ are incorrect

B) Statement $-I$ is incorrect but Statement $-II$ is correct

C) Both Statement $-I$ and Statement $-II$ are correct

D) Statement $-I$ is correct but Statement $-II$ is incorrect

93. The distance of line $3y-2z-1=0=3x-z+4$ from the point $(2,-1,6)$ is :

A) $\sqrt{26}$ B) $2\sqrt{5}$ C) $2\sqrt{6}$ D) $4\sqrt{2}$

94. Let the lines $L_1:\vec{r}=\hat{i}+2\hat{j}+3\hat{k}+\lambda(2\hat{i}+3\hat{j}+4\hat{k})$, $\lambda\in R$ and $L_2:\vec{r}=(4\hat{i}+\hat{j})+\mu(5\hat{i}+2\hat{j}+\hat{k})$, $\mu\in\mathbb{R}$, intersect at the point R. Let P and Q be the points lying on lines L_1 and L_2, respectively, such that $|\overrightarrow{PR}|=\sqrt{29}$ and $|\overrightarrow{PQ}|=\sqrt{\frac{47}{3}}$. If the point P lies in the first octant, then $27(QR)^2$ is equal to

A) 340 B) 360 C) 320 D) 348

95. The equation of the plane which contains the $y-$axis and passes through the point $(1,2,3)$. is

A) $x+3z=10$ B) $x+3z=0$ C) $3x+z=6$ D) $3x-z=0$

96. If the set of all solutions of $|x^2+x-9|=|x|+|x^2-9|$ is $[\alpha,\beta]\cup[\gamma,\infty)$, then $(\alpha^2+\beta^2+\gamma^2)$ is equal to:

A) 9 B) 18 C) 36 D) 72

97. Let $\mathrm{A}=\{(x,y)\in\mathbf{R}\times\mathbf{R}:|x+y|\geqslant 3\}$ and $\mathrm{B}=\{(x,y)\in\mathbf{R}\times\mathbf{R}:|x|+|y|\leq 3\}$.
If $\mathrm{C}=\{(x,y)\in\mathrm{A}\cap\mathrm{B}:x=0$ or $y=0\}$, then $\sum_{(x,y)\in\mathrm{C}}|x+y|$ is :

A) 15 B) 24 C) 18 D) 12

98. If a random variable x has the probability distribution

x	0	1	2	3	4	5	6	7
p(x)	0	2k	k	3k	$2k^2$	2k	k^2+k	$7k^2$

then $P(3<x\leq 6)$ is equal to

A) 0.34 B) 0.22 C) 0.64 D) 0.33

99. Let X be a binomially distributed random variable with mean 4 and variance $\frac{4}{3}$. Then $54P(X\leq 2)$ is equal to.

A) $\frac{73}{27}$ B) $\frac{146}{27}$ C) $\frac{146}{81}$ D) $\frac{126}{81}$

100. Out of 11 consecutive natural numbers if three numbers are selected at random (without repetition), then the probability that they are in $A.P.$ with positive common difference, is

A) $\frac{15}{101}$ B) $\frac{5}{101}$ C) $\frac{5}{33}$ D) $\frac{10}{99}$

Maths - Section B (Numeric)

101. Let $R=\{(x,y)\in\mathbb{N}\times\mathbb{N}:\log_e(x+y)\leq 2\}$. Then the minimum number of elements, required to be added in R to make it a transitive relation, is _____.

102. Let $A=\{1,2,3,\ldots.7\}$ and let $P(1)$ denote the power set of A. If the number of functions $\mathrm{f}:\mathrm{A}\to\mathrm{P}(\mathrm{A})$ such that $a\in\mathrm{f(a)},\forall\mathrm{a}\in\mathrm{A}$ is m^{n}, m and $\mathrm{n}\in\mathrm{N}$ and m is least, then $\mathrm{m}+\mathrm{n}$ is equal to .....

103. Let the distance between two parallel lines be 5 units and a point P lie between the lines at a unit distance from one of them. An equilateral triangle PQR is formed such that Q lies on one of the parallel lines, while R lies on the other. Then $(QR)^2$ is equal to _____ -.

104. Let α and β be two real roots of the equation $(\mathrm{k}+1)\tan^2\mathrm{x}-\sqrt{2}\cdot\lambda\tan\mathrm{x}=(1-\mathrm{k})$ where $\mathrm{k}(\neq-1)$ and λ are real numbers. If $\tan^2(\alpha+\beta)=50$, then a value of λ is :

105. Let C be the set of all complex numbers. Let
$S_1 = \left\{z \in C : |z - 3 - 2i|^2 = 8\right\}$
$S_2 = \{z \in C : Re(z) \geq 5\}$ and
$S_3 = \{z \in C : |z - \bar{z}| \geq 8\}$
Then the number of elements in $S_1 \cap S_2 \cap S_3$ is equal to:

106. If α satisfies the equation $x^2 + x + 1 = 0$ and $(1+\alpha)^7 = A + B\alpha + C^2,\ A,\ B, C \geq 0$, then $5(3A - 2B - C)$ is equal to .....

107. Let $\alpha, \beta \in N$ be roots of equation $x^2 - 70x + \lambda = 0$, where $\frac{\lambda}{2}, \frac{\lambda}{3} \notin N$. If λ assumes the minimum possible value, then $\frac{(\sqrt{\alpha-1}+\sqrt{\beta-1})(\lambda+35)}{|\alpha-\beta|}$ is equal to :

108. If for a posiive integer n , the quadratic equation, $x(x+1) + (x+1)(x+2) + \ldots + \left(x + \overline{n-1}\right)(x+n) = 10n$ has two consecutive integral solutions, then n is equal to:

109. The number of words, with or without meaning, that can be formed by taking 4 letters at a time from the letters of the word $'SYLLABUS'$ such that two letters are distinct and two letters are alike, is

110. The number of four letter words that can be formed using the letters of the word $BARRACK$ is

111. The number of positive integers k such that the constant term in the binomial expansion of $\left(2x^3 + \frac{3}{x^k}\right)^{12}, x \neq 0$ is $2^8 \cdot \ell$, where ℓ is an odd integer, is.....

112. If $\sum_{k=1}^{10} K^2 \left(10_{C_K}\right)^2 = 22000L$, then L is equal to .....

113. Let $a_1 = 8, a_2, a_3, \ldots a_n$ be an $A.P$. If the sum of its first four terms is 50 and the sum of its last four terms is 170 , then the product of its middle two terms is

114. The sum to 20 terms of the series $2.2^2 - 3^2 + 2.4^2 - 5^2 + 2.6^2 - \ldots\ldots$ is equal to .....

115. Let m_1, m_2 be the slopes of two adjacent sides of a square of side a such that $a^2 + 11a + 3\left(m_2^2 + m_2^2\right) = 220$. If one vertex of the square is $(10(\cos\alpha - \sin\alpha), 10(\sin\alpha + \cos\alpha))$, where $\alpha \in \left(0, \frac{\pi}{2}\right)$ and the equation of one diagonal is $(\cos\alpha - \sin\alpha)x + (\sin\alpha + \cos\alpha)y = 10$, then $72\left(\sin^4\alpha + \cos^4\alpha\right) + a^2 - 3a + 13$ is equal to.

116. Consider a triangle having vertices $A(-2,3), B(1,9)$ and $C(3,8)$. If a line L passing through the circum-center of triangle ABC, bisects line BC, and intersects y-axis at point $\left(0, \frac{\alpha}{2}\right)$, then the value of real number α is .....

117. Consider a circle C which touches the y-axis at $(0,6)$ and cuts off an intercept $6\sqrt{5}$ on the x axis. Then the radius of the circle C is equal to:

118. If one of the diameters of the circle $x^2 + y^2 - 2\sqrt{2}x - 6\sqrt{2}y + 14 = 0$ is a chord of the circle $(x - 2\sqrt{2})^2 + (y - 2\sqrt{2})^2 = r^2$, then the value of r^2 is equal to

119. The focus of the parabola $y^2 = 4x + 16$ is the centre of the circle C of radius 5 . If the values of λ, for which C passes through the point of intersection of the lines $3x - y = 0$ and $x + \lambda y = 4$, are λ_1 and $\lambda_2, \lambda_1 < \lambda_2$, then $12\lambda_1 + 29\lambda_2$ is equal to

120. If two tangents drawn from a point (α, β) lying on the ellipse $25x^2 + 4y^2 = 1$ to the parabola $y^2 = 4x$ are such that the slope of one tangent is four times the other, then the value of $(10\alpha + 5)^2 + \left(16\beta^2 + 50\right)^2$ equals

121. If $\lim_{x\to 0} \frac{\sin^{-1}x - \tan^{-1}x}{3x^3}$ is equal to L, then the value of $(6L + 1)$ is

122. Let $a > 0$ be a root of the equation $2x^2 + x - 2 = 0$.
If $\lim_{x\to\frac{1}{a}} \frac{16(1-\cos(2+x-2x^2))}{(1-ax^2)} = \alpha + \beta\sqrt{17}$, where $\alpha, \beta \in Z$ then $\alpha + \beta$ is equal to .....

123. If the variance of the first n natural numbers is 10 and the variance of the first m even natural numbers is 16, then $m+n$ is equal to

124. The mean and variance of a set of 15 numbers are 12 and 14 respectively. The mean and variance of another set of 15 numbers are 14 and σ^2 respectively. If the variance of all the 30 numbers in the two sets is 13,then σ^2 is equal to .....

125. Two dice are thrown 5 times, and each time the sum of the numbers obtained being 5 is considered a success. If the probability of having at least 4 successes is $\frac{\mathrm{k}}{3^{11}}$, then k is equal to

126. All five letter words are made using all the letters $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}, \mathrm{E}$ and arranged as in an English dictionary with serial numbers. Let the word at serial number n be denoted by W_n. Let the probability $\mathrm{P}\left(\mathrm{W_n}\right)$ of choosing the word $\mathrm{W_n}$ satisfy $\mathrm{P}\left(\mathrm{W_n}\right)=2\mathrm{P}\left(\mathrm{W_{n-1}}\right), \mathrm{n}>1$.
If $\mathrm{P(CDBEA)}=\frac{2^\alpha}{2^\beta-1}, \alpha, \beta \in \mathbb{N}$, then $\alpha+\beta$ is equal to : _____

127. Let a, b, c be three distinct positive real numbers such that $(2a)^{\log_e a}=(bc)^{\log_e b}$ and $b^{\log_e 2}=a^{\log_e c}$. Then $6a+5bc$ is equal to .....

128. The number of integral solutions x of $\log_{\left(x+\frac{7}{2}\right)}\left(\frac{x-7}{2x-3}\right)^2 \geq 0$ is

129. Let $A(6,8), B(10\cos\alpha, -10\sin\alpha)$ and $C(-10\sin\alpha, 10\cos\alpha)$, be the vertices of a triangle. If $L(a,9)$ and $G(h,k)$ be its orthocenter and centroid respectively, then $(5a-3h+6k+100\sin 2\alpha)$ is equal to _____ -.

130. If the orthocentre of the triangle formed by the lines $2x+3y-1=0, x+2y-1=0$ and $ax+by-1=0$, is the centroid of another triangle, whose circumcentre and orthocentre respectively are $(3,4)$ and $(-6,-8)$, then the value of $|a-b|$ is ..... .

131. Let $S=\{\theta \in [-\pi,\pi]-\{\pm\frac{\pi}{2}\} : \sin\theta\tan\theta+\tan\theta=\sin 2\theta\}$. If $T=\sum_{\theta\in S}\cos 2\theta$, then $T+n(S)$ is equal

132. The angle of elevation of a cloud C from a point $P, 200m$ above a still lake is 30°. If the angle of depression of the image of C in the lake from the point P is 60°, then PC (in m) is equal to

133. The number of relations, on the set $\{1,2,3\}$ containing $(1,2)$ and $(2,3)$, which are reflexive and transitive but not symmetric, is

134. Let $f: R \to R$ be a function defined $f(x)=\frac{2e^{2x}}{e^{2x}+\varepsilon}$. Then $f\left(\frac{1}{100}\right)+f\left(\frac{2}{100}\right)+f\left(\frac{3}{100}\right)+\ldots .+f\left(\frac{99}{100}\right)$ is equal to

135. $\tan\left(2\tan^{-1}\frac{1}{5}+\sec^{-1}\frac{\sqrt{5}}{2}+2\tan^{-1}\frac{1}{8}\right)$ is equal to.

136. If $S=\left\{x \in R : \sin^{-1}\left(\frac{x+1}{\sqrt{x^2+2x+2}}\right)-\sin^{-1}\left(\frac{x}{\sqrt{x^2+1}}\right)=\frac{\pi}{4}\right\}$
then $\sum_{x\in R}\left(\sin\left(\left(x^2+x+5\right)\frac{\pi}{2}\right)-\cos\left(\left(x^2+x+5\right)\pi\right)\right)$ is equal to .....

137. Let $S=\left\{\begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22}\end{pmatrix} : a_{ij}\in\{0,1,2\}, a_{11}=a_{22}\right\}$ Then the number of non-singular matrices in the set S is

138. If the system of equations
$2x+7y+\lambda z=3$
$3x+2y+5z=4$
$x+\mu y+32z=-1$
has infinitely many solutions, then $(\lambda-\mu)$ is equal to

139. The number of points of discontinuity of the function $f(\mathrm{x})=\left[\frac{\mathrm{x}^2}{2}\right]-[\sqrt{\mathrm{x}}], \mathrm{x}\in[0,4]$, where $[\cdot]$ denotes the greatest integer function is _____

140. Let $f : R \to R$ satisfy the equation $f(x+y) = f(x) \cdot f(y)$ for all $x, y \in R$ and $f(x) \neq 0$ for any $x \in R$. If Ihe function f is differentiable at $x = 0$ and $f'(0) = 3$, then $\lim_{h\to 0} \frac{1}{h}(f(h) - 1)$ is equal to ..... .

141. If the tangent to the curve $y = x^3 - x^2 + x$ at the point (a, b) is also tangent to the curve $y = 5x^2 + 2x - 25$ at the point $(2, -1)$, then $|2a + 9b|$ is equal to .....

142. If $\int (\sin x)^{\frac{-11}{2}} (\cos x)^{\frac{-5}{2}} dx = -\frac{p_1}{q_1}(\cot x)^{\frac{9}{2}} - \frac{p_2}{q_2}(\cot x)^{\frac{5}{2}} - \frac{p_3}{q_3}(\cot x)^{\frac{1}{2}} + \frac{p_4}{q_4}(\cot x)^{\frac{-3}{2}} + C$,where p_i and q_i are positive integers with $\gcd(p_i, q_i) = 1$ for $i = 1, 2, 3, 4$ and C is the constant of integration, then $\frac{15 p_1 p_2 p_3 p_4}{q_1 q_2 q_3 q_4}$ is equal to ___ .

143. The value of the integral $\int_4^{10} \frac{[x^2]dx}{[x^2-28x+196]+[x^2]}$, where $[x]$ denotes the greatest integer less than or equal to x, is

144. The sum of squares of all possible values of k, for which area of the region bounded by the parabolas $2\mathrm{y}^2 = \mathrm{kx}$ and $\mathrm{ky}^2 = 2(\mathrm{y} - \mathrm{x})$ is maximum, is equal to :

145. Let $y = y_1(x)$ and $y = y_2(x)$ be two distinct solutions of the differential equation $\frac{dy}{dx} = x + y$, with $y_1(0) = 0$ and $y_2(0) = 1$ respectively. Then, the number of points of intersection of $y = y_1(x)$ and $y = y_2(x)$ is.

146. If $\vec{a}$ and $\vec{b}$ are unit vectors, then the greatest value of $\sqrt{3}|\vec{a} + \vec{b}| + |\vec{a} - \vec{b}|$ is

147. If the image of the point $P(a, 2, a)$ in the line $\frac{x}{2} = \frac{y+a}{1} = \frac{z}{1}$ is Q and the image of Q in the line $\frac{x-2b}{2} = \frac{y-a}{1} = \frac{z+2b}{-5}$ is P, then $a + b$ is equal to:

148. The maximum value of z in the following equation $z = 6xy + y^2$, where $3x + 4y \leq 100$ and $4x + 3y \leq 75$ for $x \geq 0$ and $y \geq 0$ is .....

149. If a random variable X follows the Binomial distribution $B(33, p)$ such that $3P(X = 0) = P(X = 1)$, then the value of $\frac{P(X=15)}{P(X=18)} - \frac{P(X=16)}{P(X=17)}$ is equal to

150. Let $S = \left\{x \in [-6, 3] - \{-2, 2\} : \frac{|x+3|-1}{|x|-2} \geq 0\right\}$ and $T = \{x \in Z : x^2 - 7|x| + 9 \leq 0\}$. Then the number of elements in $S \cap T$ is ....