MP PET 2009

Mathematics

1. The area of the triangle whose vertices (1,0), (7,0) and (4, 4) is

(a) 8 (b) 10
(c) 12 (d) 14

Sol. (c)

2. The area enclosed within the curve $|x| + |y| = 4s$ is

(a) 16 (b) 24
(c) 32 (d) 8

Sol. (d)

3. Equation of the line passing through the point (1, 2) and perpendicular to $3x + 4y + 5 = 0$ is

(a) $3y = 4x - 2$ (b) $3y = 4x + 2$
(c) $3y = 4x + 3$ (d) $3y = 4x - 3$

Sol. (b)

4. The angle between the lines $x + 2y = 11$ and $2x - y = 9$ is

(a) 30° (b) 45°
(c) 60° (d) 90°

Sol. (d)

5. The intercept on the line $y = x$ by the circle $x^2 + y^2 - 2x = 0$ is AB. Equation of the circle on AB as a diameter is

(a) $x^2 + y^2 - x - y = 0$ (b) $x^2 + y^2 - x + y = 0$
(c) $x^2 + y^2 + x + y = 0$ (d) $x^2 + y^2 + x - y = 0$

Sol. (a)

6. The angle between the tangents drawn at the points (5, 12) and (12, –5) to the circle $x^2 + y^2 = 169$ is

(a) 45° (b) 60°
(c) 30° (d) 90°

Sol. (d)

7. The line $ax + by + c = 0$ is normal to the circle $x^2 + y^2 + 2gx + 2fy + d = 0,$ if

(a) $ag + bf + c = 0$ (b) $ag + bf - c = 0$
(c) $ag - bf + c = 0$ (d) $ag - bf - c = 0$

Sol. (b)

8. The focus of the parabola $x^2 = -4x$ is

(a) (1, 0) (b) (–1, 0)
(c) (0, 1) (d) (0, –1)

Sol. (d)

9. The locus of the vertices of the family of parabola $6y = 2a^3x^2 + 3a^2x - 12a$ is

(a) $xy = \frac{105}{64}$ (b) $xy = \frac{64}{105}$
(c) $xy = \frac{35}{16}$ (d) $xy = \frac{16}{35}$

Sol. (a)

10. The eccentricity of an ellipse whose centre is at the origin is $\frac{1}{2}$. if one of the directrices is $x = 4,$ then the equation of the ellipse is

(a) $4x^2 + 3y^2 = 6$ (b) $4x^2 + 3y^2 = 12$
(c) $3x^2 + 4y^2 = 12$ (d) $3x^2 + 4y^2 = 6$

Sol. (c)

11. The distance between the points (1, 4, 5) and (2, 2, 3) is

(a) 5 (b) 4
(c) 3 (d) 2

Sol. (c)

12. The angle between two lines $\frac{x}{2} = \frac{y}{2} = \frac{z}{-1}$ and $\frac{x-1}{2} = \frac{y-1}{2} = \frac{z-1}{2}$ is

(a) $Cos^{-1}\left(\frac{4}{9}\right)$ (b) $Cos^{-1}\left(\frac{1}{3}\right)$
(c) $Cos^{-1}\left(\frac{2}{9}\right)$ (d) $Cos^{-1}\left(\frac{5}{9}\right)$

Sol. (a)

13. The radius of the circle in which the sphere $x^2 + y^2 + z^2 + 2x - 2y - 4z - 19 = 0,$ is cut by the plane $x + 2y + 2z + 7 = 0,$ is

(a) 1 (b) 2
(c) 3 (d) 4

Sol. (c)

14. If the plane $2ax - 3ay + 4az + 6 = 0$ passes through the mid-point of the line joining the centres of the spheres $x^2 + y^2 + z^2 + 6x - 8y - 2z = 13$ and $x^2 + y^2 + z^2 - 10x + 4y - 2z = 8,$ then a is equal to

(a) 1 (b) –1
(c) 2 (d) –2

Sol. (d)

15. If the lines $3x - 4y - 7 = 0$ and $2x - 3y - 5 = 0$ are two diameters of a circle whose area is 49π Sq. units, then the equation of the circle is

(a) $x^2 + y^2 + 2x - 2y - 47 = 0$
(b) $x^2 + y^2 - 2x + 2y - 47 = 0$
(c) $x^2 + y^2 + 2x - 2y - 51 = 0$
(d) $x^2 + y^2 - 2x + 2y - 51 = 0$

Sol. (b)

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16. If C is the mid-point of AB and P is any point outside AB, then

(a) $\vec{PA}+\vec{PB}=\vec{PC}$ (b) $\vec{PA}+\vec{PB}+2\vec{PC}=\vec{0}$

(c) $\vec{PA}+\vec{PB}-2\vec{PC}=\vec{0}$ (d) $\vec{PA}+\vec{PB}+\vec{PC}=\vec{0}$

Sol. (c)

17. The points A, B, C whose position vectors are resp., $2i+j+k, i-3j-5k$ and $ai-3j+k$, forms a right-angled triangle with $\angle C=\pi/2$, then the values of a are

(a) 1 & 2 (b) –1 & –2

(c) 1 & –2 (d) –1 & 2

Sol. (a)

18. If $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\left(\vec{a}\times\vec{b}\right)\times\vec{c}$, where $\vec{a},\vec{b}$ and $\vec{c}$ are any three vectors such that $\vec{b}.\vec{c}\neq 0$, and $\vec{a}.\vec{b}\neq 0$ then $\vec{a}$ and $\vec{c}$ are

(a) Perpendicular (b) Parallel

(c) Inclined at an angle $\frac{\pi}{3}$ (d) Inclined at an angle $\frac{\pi}{6}$

Sol. (b)

19. Let $\vec{a},\vec{b},\vec{c}$ be three non-zero vectors such that no two of these are collinear. If the vector $\vec{a}+2\vec{b}$ is collinear with $\vec{c}$, then $\vec{a}+2\vec{b}+6\vec{c}$ equals

(a) $\lambda\vec{a}$ ($\lambda\neq 0$, a scalar) (b) $\lambda\vec{b}$ ($\lambda\neq 0$, a scalar)

(c) $\lambda\vec{c}$ ($\lambda\neq 0$, a scalar) (d) 0

Sol. (c)

20. If $\vec{a},\vec{b},\vec{c}$ are three vectors such that $|\vec{a}|=1, |\vec{b}|=2, |\vec{c}|=3$ and if the projection of $\vec{b}$ on $\vec{a}$ is equal to that of $\vec{c}$ on $\vec{a}$ and $\vec{b}$ and $\vec{c}$ are perpendicular to each other, then $|\vec{a}-\vec{b}+\vec{c}|$ equals

(a) $\sqrt{7}$ (b) $\sqrt{14}$

(c) $\sqrt{21}$ (d) 4

Sol. (b)

21. If $\vec{a}+\vec{b}+\vec{c}=0$ and $|\vec{a}|=5, |\vec{b}|=4$ and $|\vec{c}|=3$, then the value of $|\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}|$ is

(a) 25 (b) 50

(c) –25 (d) 20

Sol. (a)

22. 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 the angle between the vectors $\vec{b}$ and $\vec{c}$ is

(a) 30° (b) 45°

(c) 60° (d) 90°

Sol. (c)

23. The value of $(\vec{a}.i)i+(\vec{a}.j)j+(\vec{a}.k)k$ is

(a) 0 (b) $\vec{a}$

(c) $-\vec{a}$ (d) $3\vec{a}$

Sol. (b)

24. The vectors $\overrightarrow{AB}=3i+4k$ and $\overrightarrow{AC}=5i-2j+4k$ are the sides of a triangle ABC, then the length of the median through A is

(a) $\sqrt{118}$ (b) $\sqrt{88}$

(c) $\sqrt{72}$ (d) $\sqrt{33}$

Sol. (d)

25. For any vector $\vec{a}$, the value of $(\vec{a}\times i)^2+(\vec{a}\times j)^2+(\vec{a}\times k)^2$ is

(a) $\vec{a}^2$ (b) $2\vec{a}^2$

(c) $3\vec{a}^2$ (d) $4\vec{a}^2$

Sol. (a)

26. The differential equation, whose solution is $Ax^2+by^2=1$, where A and B are arbitrary constants, is of

(a) Second order and second degree

(b) Second order and first degree

(c) First order and second degree

(d) First order and first degree

Sol. (a)

27. The order and degree of the differential equation $\left(1+4\frac{dy}{dx}\right)^{2/3}=4\frac{d^2y}{dx^2}$ are respectively

(a) $1,\frac{2}{3}$ (b) 3, 2

(c) 2, 3 (d) $2,\frac{2}{3}$

Sol. (c)

28. If $y=\left[x+\sqrt{1+x^2}\right]^n$, then the value of $(1+x^2)\frac{d^2y}{dx^2}+x\frac{dy}{dx}$ is

(a) n^2y (b) $-n^2y$

(c) ny (d) $-ny$

Sol. (a)

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29. The solution of the differential equation $ydx + (x + x^2y)dy = 0$ is

(a) $\frac{1}{xy} + \log x = c$ (b) $-\frac{1}{xy} + \log x = c$

(c) $\frac{1}{xy} + \log y = c$ (d) $-\frac{1}{xy} + \log y = c$

Sol. (d)

30. The solution of the differential equation $\frac{dy}{dx} = e^{x+y}$ is

(a) $e^x + e^y = c$ (b) $e^x - e^y = c$

(c) $e^x + e^{-y} = c$ (d) $e^x - e^{-y} = c$

Sol. (c)

31. The solution of the differential equation $\frac{d^2y}{dx^2} = e^{2x}$ is

(a) $y = -\frac{1}{4}e^{-2x} + cx^2 + d$ (b) $y = \frac{1}{4}e^{-2x} + cx^2 + d$

(c) $y = -\frac{1}{4}e^{-2x} + cx + d$ (d) $y = \frac{1}{4}e^{-2x} + cx + d$

Sol. (d)

32. If A and B are two events such that $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$ and $P(\overline{B}) = \frac{1}{3}$, then the value of $P(A)$ is

(a) $\frac{1}{3}$ (b) $\frac{1}{4}$

(c) $\frac{1}{2}$ (d) $\frac{2}{3}$

Sol. (c)

33. If bag A contains 2 white and 3 red balls and bag B contains 4 white and 5 red balls. A ball is selected randomly from a randomly selected bag and is found to be red. Then the probability that it is selected from bag B is

(a) $\frac{25}{52}$ (b) $\frac{5}{18}$

(c) $\frac{21}{52}$ (d) $\frac{13}{18}$

Sol. (a)

34. The probability that A speaks truth is $\frac{4}{5}$ and the probability that B speaks truth is $\frac{3}{4}$. The probability that they contradict each other when asked to speak on a fact is

(a) $\frac{3}{10}$ (b) $\frac{7}{20}$

(c) $\frac{1}{4}$ (d) $\frac{2}{5}$

Sol. (b)

35. A random variable X has the probability distribution

X	1	2	3	4	5	6	7	8
$P(X)$	0.15	0.23	0.12	0.10	0.20	0.08	0.07	0.05

For the events $E = \{X$ is a prime number$\}$ and $F = \{X < 4\}$, then $P(E \cup F)$ is

(a) 0.77 (b) 0.87

(c) 0.35 (d) 0.50

Sol. (a)

36. The mean and the variance of a binomial distribution are 4 and 2 respectively, then the probability of two successes is

(a) $\frac{28}{256}$ (b) $\frac{42}{256}$

(c) $\frac{56}{256}$ (d) $\frac{72}{256}$

Sol. (a)

37. In a class of 100 students, there are 70 boys whose average marks are 750. If the average marks of the complete class are 720, then the average marks of the girls are

(a) 700 (b) 650

(c) 690 (d) 680

Sol. (b)

38. If there students A, B, C can solve a problem with probabilities $\frac{1}{3}, \frac{1}{4}$ and $\frac{1}{5}$ respectively, then the probability that the problem will be solved is

(a) $\frac{3}{5}$ (b) $\frac{4}{5}$

(c) $\frac{2}{5}$ (d) $\frac{47}{60}$

Sol. (a)

39. A pair of fair dice is thrown independently 4 times. The probability of getting a sum of exactly 7 twice is

(a) $\frac{5}{81}$ (b) $\frac{25}{243}$

(c) $\frac{25}{216}$ (d) $\frac{125}{648}$

Sol. (c)

40. The probability that the three cards, drawn from a pack of 52 cards, are all black, is

(a) $\frac{1}{17}$ (b) $\frac{2}{17}$

(c) $\frac{3}{17}$ (d) $\frac{2}{19}$

Sol. (b)

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41. If A (h, k), B (1, 1) and C (2, 1) are the vertices of a right-angled triangle with AC as its hypotenuse and if the area of the triangle is 1, then the values of k are

(a) 0, 2 (b) 1,3
(c) –2, 3 (d) –1, 3

Sol. (d)

42. If $\vec{a} = i + j + k, \vec{b} = i - j + 2k$ and $\vec{c} = xi + (x-2)j - k$ and if the vector $\vec{c}$ lies in the plane of vectors $\vec{a}$ and $\vec{b}$, then x equals

(a) 0 (b) 1
(c) –2 (d) 2

Sol. (c)

43. If $z^2 + z + 1 = 0$, where z is a complex number then the value of $\left(z+\frac{1}{z}\right)^2 + \left(z^2+\frac{1}{z^2}\right)^2 + \left(z^3+\frac{1}{z^3}\right)^2 + \ldots\ldots + \left(z^6+\frac{1}{z^6}\right)^2$ is

(a) 6 (b) 12
(c) 18 (d) 24

Sol. (b)

44. The local minimum of the function $f(x) = \frac{x}{2} + \frac{2}{x}$ is

(a) at $x=2$ (b) at $x=-2$
(c) at $x=0$ (d) at $x=1$

Sol. (a)

45. If $0 < x < \pi$ and $\cos x + \sin x = \frac{1}{2}$, then the value of tan x is

(a) $\frac{2-\sqrt{7}}{3}$ (b) $-\frac{4+\sqrt{7}}{3}$
(c) $-\frac{1+\sqrt{7}}{3}$ (d) $-\frac{2+\sqrt{7}}{3}$

Sol. (b)

46. The number of real solutions of the equation $x^2 - 3|x| + 2 = 0$ is

(a) 1 (b) 2
(c) 3 (d) 4

Sol. (d)

47. The value of a for which one root of the quadratic equation $(a^2 - 5a + 3)x^2 + (3a-1)x + 2 = 0$, is twice of the other root, is

(a) $\frac{2}{3}$ (b) $-\frac{2}{3}$
(c) $\frac{1}{3}$ (d) $-\frac{1}{3}$

Sol. (a)

48. If the function $f(x) = 2x^3 - 9ax^2 + 12a^2x + 1$, where $a > 0$, attains its maximum and minimum at p and q respectively and $p^2 = q$, then a equals

(a) 1 (b) 2
(c) 3 (d) $\frac{1}{2}$

Sol. (b)

49. If $A^2 - A + I = 0$, then A^{-1} is equal to

(a) A (b) $I+A$
(c) $I-A$ (d) $A-I$

Sol. (c)

50. The angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is

(a) 30° (b) 45°
(c) 60° (d) 90°

Sol. (d)

51. The solutions of the equation $4\cos^2 x + 6\sin^2 x = 5$ are

(a) $x = n\pi \pm \frac{\pi}{4}$ (b) $x = n\pi \pm \frac{\pi}{3}$
(c) $x = n\pi \pm \frac{\pi}{2}$ (d) $x = n\pi \pm \frac{2\pi}{3}$

Sol. (a)

52. Maximum value of $12x + 3y$ subject to constraints $x \geq 0, y \geq 0, x + y \leq 5$ and $3x + y \leq 9$ is

(a) 15 (b) 36
(c) 60 (d) 40

Sol. (b)

53. If $f(x+ay, x-ay) = axy$, then $f(x, y)$ is equal to

(a) xy (b) $(x^2 - a^2y^2)$
(c) $\frac{x^2-y^2}{4}$ (d) $\frac{x^2-y^2}{a^2}$

Sol. (c)

54. If $\lim_{x\to 0}\frac{\log(x+a)-\log a}{x} + k\lim_{x\to e}\frac{\log x - 1}{x-e} = 1$, then the value of k is

(a) $1-\frac{1}{a}$ (b) $e\,(1-a)$
(c) $e\left(1-\frac{1}{a}\right)$ (d) $e\,(1+a)$

Sol. (c)

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55. If $f(2)=4$ and $f'(2)=1$, then the value of $\lim_{x\to 2}\frac{xf(2)-2f(x)}{x-2}$ is

(a) -3 (b) 1
(c) 3 (d) 2

Sol. (d)

56. The value of $\lim_{x\to\infty}\left(\frac{x-3}{x+2}\right)^x$, for $x\in R$, is

(a) e^5 (b) e^{-5}
(c) e (d) e^{-1}

Sol. (b)

57. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is 6. The probability that it is actually a 6, is

(a) $\frac{1}{8}$ (b) $\frac{1}{4}$
(c) $\frac{3}{8}$ (d) $\frac{1}{2}$

Sol. (c)

58. The sum of the series $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+\ldots\ldots$ upto ∞, is

(a) $\frac{35}{16}$ (b) $\frac{37}{16}$
(c) $\frac{39}{16}$ (d) 3

Sol. (a)

59. The Geometric mean of $1,2,2^2,\ldots\ldots,2^n$ is

(a) $2^{n/2}$ (b) $n^{(n+1)/2}$
(c) $2^{n(n+1)/2}$ (d) $2^{(n-1)/2}$

Sol. (d)

60. If $y=\log x^x$, then the value of $\frac{dy}{dx}$ is

(a) $x^x(1+\log x)$ (b) $\log(ex)$
(c) $\log\left(\frac{e}{x}\right)$ (d) $\log\left(\frac{x}{e}\right)$

Sol. (b)

61. If $\vec{x}=0, \vec{y}=0, \sum x_iy_i=24, \sigma_x=3, \sigma_y=4$ and $n=10$, then the coefficient of correlation is

(a) 0.1 (b) 0.2
(c) 0.3 (d) 0.4

Sol. (b)

62. A line makes the same angle θ with x-axis and z-axis. If the angle β, which it makes with y-axis, is such that $\sin^2\beta=3\sin^2\theta$, then the value of $\cos^2\theta$ is

(a) $\frac{1}{5}$ (b) $\frac{2}{5}$
(c) $\frac{3}{5}$ (d) $\frac{2}{3}$

Sol. (c)

63. Distance between two parallel planes $2x+y+2z=8$ and $4x+2y+4z+5=0$ is

(a) $\frac{7}{2}$ (b) $\frac{13}{3}$
(c) $\frac{13}{6}$ (d) $\frac{7}{3}$

Sol. (a)

64. Distance between two lines represented by the pair of straight lines $x^2-6xy+9y^2+3x-9y-4=0$ is

(a) $\frac{1}{2}$ (b) $\frac{5}{\sqrt{2}}$
(c) $\sqrt{10}$ (d) $\sqrt{\frac{5}{2}}$

Sol. (d)

65. If the line $y=2x+c$ is tangent to the ellipse $\frac{x^2}{8}+\frac{y^2}{4}=1$, then the value of c is

(a) ± 6 (b) $\pm 2\sqrt{7}$
(c) $\pm 2\sqrt{5}$ (d) $\pm 2\sqrt{3}$

Sol. (a)

66. The number of solutions of the equation $Z^2+\overline{Z}=0$ is

(a) 1 (b) 2
(c) 3 (d) 4

Sol. (b)

67. If $z=x+iy$ and $z^{1/3}=a-ib$, then $\frac{x}{a}-\frac{y}{b}=k(a^2-b^2)$ when the value of k is

(a) 4 (b) 3
(c) 2 (d) 1

Sol. (a)

68. If $(x+iy)=\sqrt{\frac{1+2i}{3+4i}}$, then $(x^2+y^2)^2=$

(a) 5 (b) $\frac{1}{5}$
(c) $\frac{2}{5}$ (d) $\frac{5}{2}$

Sol. (b)

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69. If α and β are the roots of : $ax^2 + 2bx + c = 0$, then $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is equal to

(a) $\frac{4b^2 - 2ac}{ac}$ (b) $\frac{4b^2 - 4ac}{ac}$

(c) $\frac{2b^2 - 2ac}{ac}$ (d) $\frac{2b^2 - 4ac}{ac}$

Sol. (a)

70. If $\frac{5+9+13+\text{.........}n \text{ terms}}{7+9+11+\text{.........}12 \text{ terms}} = \frac{5}{12}$, then $n =$

(a) 5 (b) 6

(c) 9 (d) 12

Sol. (b)

71. If the sum of the series $2+5+8+11+$........ is 60100, then the number of terms is

(a) 100 (b) 150

(c) 200 (d) 250

Sol. (c)

72. If the first, second and last terms of an arithmetic series are a, b and c respectively then the number of terms is

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

(c) $\frac{b+c-2a}{b+a}$ (d) $\frac{b+c+2a}{b+a}$

Sol. (a)

73. The term independent of x in $\left[\sqrt{x} - \frac{2}{x}\right]^{18}$ is

(a) ${}^{18}C_{12}2^8$ (b) ${}^{18}C_6 2^{12}$

(c) ${}^{18}C_6 2^4$ (d) ${}^{18}C_{12}2^6$

Sol. (d)

74. The value of ${}^{47}C_4 + \sum_{j=1}^{5} {}^{(52-j)}C_3$ is

(a) ${}^{47}C_5$ (b) ${}^{52}C_5$

(c) ${}^{52}C_4$ (d) ${}^{52}C_3$

Sol. (c)

75. If $2^x.3^{x+4} = 7^x$, then $x =$

(a) $\frac{4\log_e 3}{\log_e 7 - \log_e 6}$ (b) $\frac{4\log_e 3}{\log_e 6 - \log_e 7}$

(c) $\frac{2\log_e 3}{\log_e 7 - \log_e 6}$ (d) $\frac{3\log_e 4}{\log_e 6 - \log_e 7}$

Sol. (a)

76. If $\begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix} = k\begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}$

then the value of k is

(a) 1 (b) 2

(c) 3 (d) 4

Sol. (d)

77. If $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = \lambda a^2 b^2 c^2$, then the value of λ is:

(a) 1 (b) 2

(c) 3 (d) 4

Sol. (d)

78. The matrix $\begin{bmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is invertible if

(a) $\lambda \neq -17$ (b) $\lambda \neq -18$

(c) $\lambda \neq -19$ (d) $\lambda \neq -20$

Sol. (a)

79. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and A^2 is the identity matrix, then $x =$

(a) -1 (b) 0

(c) 1 (d) 2

Sol. (b)

80. If A^T, B^T are transpose matrices of the square matrices A, B respectively, then $(AB)^T$ is equal to

(a) $A^T B^T$ (b) AB^T

(c) BA^T (d) $B^T A^T$

Sol. (d)

81. If $\sin\theta + \text{cosec}\,\theta = 3$, then $\sin^2\theta + \text{cosec}^2\theta =$

(a) 7 (b) 9

(c) 11 (d) 5

Sol. (a)

82. The value of : $\sin 50° - \sin 70° + \sin 10°$ is

(a) 0 (b) 1

(c) $\frac{1}{2}$ (d) $\frac{1}{\sqrt{2}}$

Sol. (a)

83. The maximum value of $3\cos\theta + 4\sin\theta$ is

(a) 3 (b) 4

(c) 5 (d) 7

Sol. (c)

84. If $\tan\alpha = \frac{n}{n+1}$ and $\tan\beta = \frac{1}{2n+1}$, then $\alpha + \beta =$

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$

(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{5}$

Sol. (b)

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85. If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then $\frac{\tan x}{\tan y} =$

(a) 0 (b) ab

(c) $\frac{b}{a}$ (d) $\frac{a}{b}$

Sol. (d)

86. $\lim_{x\to 0} \frac{(1+x)^8 - 1}{(1+x)^2 - 1}$ is equal to

(a) 8 (b) 6

(c) 4 (d) 2

Sol. (c)

87. $\lim_{x\to 0} \frac{x\cos x + \sin x}{x^2 + \tan x}$ is equal to

(a) –1 (b) 0

(c) 1 (d) 2

Sol. (d)

88. If $f(x) = \begin{cases} x, & x \ge 0 \\ -x, & x < 0 \end{cases}$, then

(a) $f(x)$ is differentiable at $x = 0$

(b) $f(x)$ is not continuous at $x = 0$

(c) $f(x)$ is continuous at $x = 0$ but not differentiable

(d) $f(x)$ is continuous and differentiable at $x = 0$

Sol. (c)

89. If the function $f: N \to N$ is defined by $f(x) = \sqrt{x}$, then $\frac{f(25)}{f(16)+f(1)}$ is equal to

(a) $\frac{5}{6}$ (b) $\frac{5}{7}$

(c) $\frac{5}{3}$ (d) 1

Sol. (d)

90. If $x^y = y^x$, then $\frac{dy}{dx} =$

(a) $\frac{y(x\log y - y)}{x(y\log x - x)}$ (b) $\frac{y(x\log y + y)}{x(y\log x + x)}$

(c) $\frac{y(y\log x - x)}{x(x\log y - y)}$ (d) $\frac{y(y\log x + x)}{x(x\log y + y)}$

Sol. (a)

91. If $x^m y^n = (x+y)^{m+n}$, then $\frac{dy}{dx} =$

(a) $\frac{x}{y}$ (b) $\frac{y}{x}$

(c) $\frac{x+y}{xy}$ (d) $\frac{xy}{x+y}$

Sol. (b)

92. The maximum value of $f(x) = \sin x.(1+\cos x)$ is

(a) $\frac{3\sqrt{3}}{4}$ (b) $\frac{3\sqrt{3}}{2}$

(c) $3\sqrt{3}$ (d) $\sqrt{3}$

Sol. (a)

93. If in a ΔABC, the altitude from the vertices A,B,C on opposite sides are in H.P., then $\sin A, \sin B, \sin C$ are in

(a) G.P.
(b) Arithmetic geometric progression
(c) A.P.
(d) H.P.

Sol. (c)

94. $\int \frac{1}{1+\cos x + \sin x} dx =$

(a) $\log\left|1+\tan\frac{x}{2}\right| + c$ (b) $\frac{1}{2}\log\left|1+\tan\frac{x}{2}\right| + c$

(c) $2\log\left|1+\tan\frac{x}{2}\right| + c$ (d) $\frac{1}{2}\log\left|1-\tan\frac{x}{2}\right| + c$

Sol. (a)

95. $\int \sin^3 x.\cos^2 x\, dx =$

(a) $\frac{\sin^5 x}{5} - \frac{\sin^3 x}{3} + c$ (b) $\frac{\sin^5 x}{5} + \frac{\sin^3 x}{3} + c$

(c) $\frac{\cos^5 x}{5} - \frac{\cos^3 x}{3} + c$ (d) $\frac{\cos^5 x}{5} + \frac{\cos^3 x}{3} + c$

Sol. (c)

96. $\int \frac{x^4 + x^2 + 1}{x^2 - x + 1} dx =$

(a) $\frac{x^3}{3} - \frac{x^2}{2} + x + c$ (b) $\frac{x^3}{3} + \frac{x^2}{2} + x + c$

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

Sol. (b)

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

(a) 0 (b) $\pi/4$

(c) $\pi/3$ (d) $\pi/2$

Sol. (b)

98. $\int_0^{\pi} \frac{x}{1+\sin x} dx =$

(a) 0 (b) $\pi/4$

(c) $\pi/2$ (d) π

Sol. (d)

99. The area enclosed between the curves $y^2 = x$ and $y = |x|$ is

(a) $\frac{1}{6}$ (b) $\frac{1}{3}$

(c) $\frac{2}{3}$ (d) 1

Sol. (a)

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

(a) $-\pi\log 2$ (b) $\pi\log 2$

(c) $-\frac{\pi}{2}\log 2$ (d) $\frac{\pi}{2}\log 2$

Sol. (c)