MP PET 2009

Mathematics

1. The area of the triangle whose vertices (1,0), (7,0) and (4, 4) is **[MP PET 2009]**

(a) 8 (b) 10

(c) 12 (d) 14

Sol. (c)

2. The area enclosed within the curve $|x|+|y|=4s$ is **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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)

16. If C is the mid-point of AB and P is any point outside AB, then **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

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

(c) ny (d) $-ny$

Sol. **(a)**

29. The solution of the differential equation $ydx + (x + x^2y)dy = 0$ is **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

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

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

Sol. (b)

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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

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

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

Sol. (c)

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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 $Z^2+\bar{Z}=0$ is **[MP PET 2009]**

(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 **[MP PET 2009]**

(a) 4 (b) 3

(c) 2 (d) 1

Sol. **(a)**

68. If $(x+iy)=\sqrt{\frac{1+2i}{3+4i}}$, then $(x^2+y^2)^2=$ **[MP PET 2009]**

(a) 5 (b) $\frac{1}{5}$

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

Sol. **(b)**

69. If α and β are the roots of : $ax^2 + 2bx + c = 0$, then $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is equal to **[MP PET 2009]**

(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 $\frac{5 + 9 + 13 + ...n \text{ terms}}{7 + 9 + 11 + ...12 \text{ terms}} = \frac{5}{12}$, then $n =$ **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 $x =$ **[MP PET 2009]**

(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 **[MP PET 2009]**

(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: **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 $x =$ **[MP PET 2009]**

(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 **[MP PET 2009]**

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

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

Sol. **(d)**

81. If $\sin\theta + \operatorname{cosec}\theta = 3$, then $\sin^2\theta + \operatorname{cosec}^2\theta =$ **[MP PET 2009]**

(a) 7 (b) 9

(c) 11 (d) 5

Sol. **(a)**

82. The value of : $\sin 50° - \sin 70° + \sin 10°$ is **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 $\alpha + \beta =$ **[MP PET 2009]**

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

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

Sol. **(b)**

85. If $\frac{\sin(x+y)}{\sin(x-y)}=\frac{a+b}{a-b}$, then $\frac{\tan x}{\tan y}=$ **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(a) –1 (b) 0

(c) 1 (d) 2

Sol. **(d)**

88. If $f(x)=\begin{cases} x, & x\geq 0 \\ -x, & x<0 \end{cases}$, then **[MP PET 2009]**

(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 **[MP PET 2009]**

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

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

Sol. **(d)**

90. If $x^y=y^x$, then $\frac{dy}{dx}=$ **[MP PET 2009]**

(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 $\frac{dy}{dx}=$ **[MP PET 2009]**

(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 **[MP PET 2009]**

(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 **[MP PET 2009]**

(a) G.P.

(b) Arithmetic geometric progression

(c) A.P.

(d) H.P.

Sol. **(c)**

94. $\int\frac{1}{1+\cos x+\sin x}dx=$ **[MP PET 2009]**

(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. $\int\sin^3 x.\cos^2 x\,dx=$ **[MP PET 2009]**

(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. $\int\frac{x^4+x^2+1}{x^2-x+1}dx=$ **[MP PET 2009]**

(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. $\int_0^{\pi/2}\frac{\sqrt{\cos x}}{\sqrt{\cos x}+\sqrt{\sin x}}dx=$ **[MP PET 2009]**

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

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

Sol. **(b)**

98. $\int_0^{\pi}\frac{x}{1+\sin x}dx=$ **[MP PET 2009]**

(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 **[MP PET 2009]**

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

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

Sol. **(a)**

100. $\int_0^{\pi/2}\log\sin x\,dx=$ **[MP PET 2009]**

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

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

Sol. **(c)**