MATHEMATICS-2008

Q.1. Which of the following is true

(a) $A \cap B \subset A \cup B$

(b) $A \cap B \subseteq A \cup B$

(c) $A \cup B \subset A \cap B$

(d) None of these

Q.2. If A = [1, 2, 3, 4] and B = [5, 6, 7] then number of relations from A to B is equal to

(a) 2^4

(b) 2^3

(c) 2^7

(d) 2^{12}

Q.3. $(Z-1)(\overline{Z}-1)$ can be written as

(a) $Z\overline{Z}+1$

(b) $|Z|^2+1$

(C) $|Z-1|^2$

(d) $|Z|^2+2$

Q.4. If the complex number Z_1, Z_2, Z_3 satisfy relation $Z_1 - 2Z_2 + Z_3 = 0$ then

(a) points Z_1, Z_2, Z_3 are collinear

(b) points Z_1, Z_2, Z_3 are concyclic

(c) points Z_1, Z_2, Z_3 are vertices of an equilateral triangle

(d) none of the above

Q.5. The number of real roots the equation $x^{2n} - 1 = 0$ is

(a) 2

(b) 3

(c) n

(d) 2n

Q.6. The number of real roots of $(x-1)^4 + (x+1)^4 = 16$ is

(a) 1

(b) 2

(c) 0

(d) none of the above

Q.7. If one root of $x^2 + x - k = 0$ is square of other then k is equal to

(a) 1

(b) $2 \pm \sqrt{3}$

(c) 0

(d) none of these

Q.8. $|3x+7| < 5$ then x belongs to

(a) $(-4,-3)$

(b) $\left(-4,-\frac{2}{3}\right)$

(c) $(-5,5)$

(d) $\left(-\frac{5}{3},\frac{5}{3}\right)$

Q.9. $|2x-3| < |x+5|$ then x belongs to

(a) (-3, 5)
(b) (5, 9)
(c) $\left(-\frac{2}{3},8\right)$
(d) $\left(-8,\frac{2}{3}\right)$

Q.10. If a,b,c, are in A.P then e^{-a},e^{-b},e^{-c} are in

(a) A.P
(b) G.P
(c) H.P
(d) none of these

Q.11. If the lines $x+2ay+a=0$, $x+3by+b=0$ and $x+4cy+c=0$ are concurrent then a, b and c are in

(a) A.P
(b) G.P
(c) H.P
(d) none of these

Q.12. If a,b,c are in A.P, a,b,d are in G.P then a, a-b, d-c are in

(a) A.P
(b) G.P
(c) H.P
(d) none of these

Q.13. The value of $\sum_{r=1}^{12} {}^{24}C_r$ is equal to

(a) $2^{24}-{}^{24}C_{12}-1$
(b) $2^{23}+\frac{1}{2}{}^{24}C_{12}-1$
(c) 2^{24}
(d) none of these

Q.14. If C_r stand for ${}^nC_r$ then

$\left(C_0+C_1\right)+\left(C_1+C_2\right)+---+\left(C_{n-1}+C_n\right)$ is equal to

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

Q.15. The term independent of x in the expansion of $\left(\frac{x^2}{2}-\frac{2}{x}\right)^9$ is equal to

(a) ${}^9C_6(2^3)$
(b) ${}^9C_5(2)^4$
(c) ${}^9C_7(2^5)$
(d) none of these

Q.16. The co-efficient of x^{-2} in the expansion of $\left(x^2+\frac{1}{2}\right)^5$ is equal to

(a) ${}^5C_2$
(b) ${}^5C_3$
(c) ${}^5C_4$
(d) ${}^5C_5$

Q.17. If the equations $x+2y+3=0$, $2x+3y+5=0$ and $ax+by+8=0$ are consistent then a+b is equal to

(a) 8 (b) 0

(c) 10 (d) none of these

Q.18. $\begin{vmatrix} 1+x & 1 & 1 \\ 1 & 1+y & 1 \\ 1 & 1 & 1+z \end{vmatrix}$ equals

(a) $x+y+z$ (b) $xyz+xy+yz+zx$

(c) $x^3+y^3+z^3$ (d) $x^2y^2z^2$

Q.19. If x,y,z are non zero real numbers then the value of $\begin{vmatrix} \frac{1}{x} & x^2 & yz \\ \frac{1}{y} & y^2 & zx \\ \frac{1}{z} & z^2 & xy \end{vmatrix}$ is equal to

(a) xyz (b) $x^2y^2z^2$

(c) $\frac{1}{xyz}$ (d) none of these

Q.20. $\begin{bmatrix} 1 & 2 \\ 5 & 7 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} 1 \\ 2 \end{bmatrix}$ then

(a) $x=1, y=-1$ (b) $x=0, y=1$

(c) $x=-1, y=1$ (d) $x=1, y=0$

Q.21. $2^{3n}-7n-1$ is divisible by

(a) 64 (b) 36

(c) 49 (d) 25

Q.22. The value of ${}^{16}C_6-{}^{15}C_6$ is equal to

(a) ${}^{15}C_4$ (b) ${}^{15}C_8$

(c) ${}^{15}C_5$ (d) ${}^{15}C_4$

Q.23. Number of ways of arranging 5 boys and 3 girls in row so that no two girls are together is

(a) 5! 3! (b) ${}^6C_3$ 5! 3!

(c) 2 (5! 3!) (d) none of these

Q.24. If ${}^nC_4, {}^nC_5, {}^nC_6$ are in A.P then value of n is

(a) 14 or 7
(b) 11
(c) 7
(d) 8

Q.25. If the letters of the word SUCCESS are arranged then the probability that similar letters occur together is

(a) $\frac{4}{35}$
(b) $\frac{3}{35}$
(c) $\frac{1}{35}$
(d) $\frac{2}{35}$

Q.26. Two numbers are selected randomly from the set. S=[1,2,3,4.5.6] without replacement on by one. The probability that minimum of two numbers is less than 4 is

(a) $\frac{1}{15}$
(b) $\frac{14}{15}$
(c) $\frac{1}{5}$
(d) $\frac{4}{5}$

Q.27. Twenty five coins are tossed simultaneously. The probability that the fifth coin will fall with head upward is

(a) $\frac{5}{25}$
(b) $\frac{5}{2^{25}}$
(c) $\frac{1}{2}$
(d) noen of these

Q.28. $\sec^2\theta = \frac{4xy}{(x+y)^2}$ is true if and only if

(a) $x+y \neq 0$
(b) $x=y, x\neq 0$
(c) $x=y$
(d) $x\neq 0, y\neq 0$

Q.29. Solution of $\sin^4 x = 1+\cos^2 x$ is

(a) $2m\pi + \frac{\pi}{2}$
(b) $n\pi$
(c) $2n\pi$
(d) $n\pi + \frac{\pi}{2}$

Q.30. The value of $\cos^{-1}\left(\cos\left(2\tan^{-1}\left(\sqrt{2}+1\right)\right)\right)$ is

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$

(c) $\frac{3\pi}{4}$ (d) none of these

Q.31. $\sin^{-1}(\sin x)$ is a periodic function with period

(a) π (b) 2π

(c) 4π (d) none of these

Q.32. If $b\cos B = c\cos C$ then the triangle is

(a) Equilateral (b) Isosceles

(c) Right angled (d) none of these

Q.33. $\sin A:\sin C = \sin(A-B):\sin(B-C)$ then a^2, b^2, c^2 are in

(a) A.P (b) G.P

(c) H.P (d) none of these

Q.34. If the radius of incircles of a triangle with its sides 5k, 6k and 5k is 6 then k is equal to

(a) 3 (b) 4

(c) 5 (d) 6

Q.35. If orthocenter and circum-centre are a triangle are respectively (1, 1) and (3, 2) then coordinates of its centroid are

(a) $\left(\frac{7}{3},\frac{5}{3}\right)$ (b) $\left(\frac{5}{3},\frac{7}{3}\right)$

(c) (7, 5) (d) (5, 7)

Q.36. The determinant $\begin{vmatrix} x & y & 1 \\ x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \end{vmatrix} = 0$ represents

(a) a pair of straight line (b) a straight line

(c) a circle (d) none of these

Q.37. The triangle with vertices A(2, 7); B(4, y) and C(-2, 6) is right angled if

(a) y = -1 (b) y = 0

(c) y = 1 (d) none of these

Q.38. If a,b,c are in A.P. then $ax+by+c=0$ represents

(a) a single line
(b) family of concurrent lines
(c) a family of parallel lines
(d) a family of intersecting lines

Q.39. P(2, 1) in image of the point Q(4, 3) about the line

(a) $x-y=1$
(b) $3x-3y=0$
(c) $x+y=5$
(d) $x+y=-5$

Q.40. If equation $4x^2+2pxy+25y^2+2x+5y-1=0$ represent parallel lines then p is equal to

(a) -10
(b) 10
(c) 5
(d) -2

Q.41. The orthocenter of triangle formed by the lines $x=0$, $y=2x$ and $x+2y=5$ is

(a) (0, 0)
(b) $\left(0,\frac{5}{2}\right)$
(c) (1, 2)
(d) none of these

Q.42. If the area of a triangle with vertices (4, 0), (1, 1) and (3, a) be 2 then a is equal to

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

Q.43. The circle $x^2+y^2-10x-14y+24=0$ cuts an intercept on y-axis of length

(a) 5
(b) 10
(c) 1
(d) -5

Q.44. The area of square inscribed in a circle $x^2+y^2-6x-8y=0$ is

(a) 100sq. units
(b) 50sq. units
(c) 25 sq. units
(d) 75 sq. units

Q.45. -centers of -circles of radius 5 touching the line $3x+4y=7$ at (1, 1) is

(a) (4, 5) and (-2, -3)
(b) (-4, -5) and (2, 3)
(c) (-4, -5) and (6, 7)
(d) (4, 5) and (-6, -7)

Q.46. The number of common tangent to the -circles $x^2+y^2-2x-4y+1=0$ and $x^2+y^2-12x-16y+91=0$ is

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

Q.47. The radius of the –circle passing through the points (5, 2) and (5, -2) is

(a) $2\sqrt{5}$ (b) $3\sqrt{2}$

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

Q.48. If the –circles of same radius r and –centers at (3, 4) and (7, 8) cut orthogonally, then r is equal to

(a) 2 (b) 3

(c) 4 (d) 5

Q.49. The in –centre of the triangle with vertices (1, $\sqrt{3}$); (0, 0) and (2, 0) is

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

(c) $\left(\frac{2}{3}, \frac{\sqrt{3}}{2}\right)$ (d) $\left(1, \frac{1}{\sqrt{3}}\right)$

Q.50. If the –circle –centered at (4, 3) touches a line $x+y-1$ then its point of contact is

(a) (1, 2) (b) (1, 0)

(c) (0, 1) (d0 (0, 2)

Q.51. Chord of parabola $y^2 = 8x$ whose mid-point is (8, 2) is

(a) a focal chord (b) a normal chord

(c) a double ordinate (d) none of these

Q.52.The tangents from (0, a) to the parabola $y^2 + 4a^2 = 4ax$ are inclined at

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

(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{4}$

Q.53. The equation of direction of the parabola $y^2 + 4y + 4x = 2 = 0$ is

(a) $x = -1$ (b) $x = 1$

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

Q.54. The length of latus rectum of parabola $169\left[(x-1)^2 + (y-3)^2\right] = (5x - 12y + 17)^2$ is

(a) $\frac{14}{13}$ (b) $\frac{12}{13}$

(c) $\frac{28}{13}$ (d) $\frac{24}{13}$

Q.55. The circle $x^2+y^2+2\lambda x=0, \lambda \in R$ touches the parabola $y^2=4x$ externally then

(a) $\lambda > 0$ (b) $\lambda < 0$

(c) $\lambda > 1$ (d) $\lambda < 1$

Q.56. Number of tangents from (7, 6) to ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ is

(a) 0 (b) 1

(c) 2 (d) none of these

Q.57. Equation $\frac{x^2}{k}+\frac{y^2}{k^2}=1$ represents an ellipse when

(a) k < 0 (b) k > 0

(c) $k \in R-|0|$ (d) none of these

Q.58. Eccentricity of Hyperbola $\frac{x^2}{k}+\frac{y^2}{k^2}=1(k<0)$ is

(a) $\sqrt{1+k}$ (b) $\sqrt{1-k}$

(c) $\sqrt{1+\frac{1}{k}}$ (d) $\sqrt{1-\frac{1}{k}}$

Q.59. If hyperbola $x^2-y^2=a^2$ and $xy=c^2$ are same of size then

(a) $c^2=2a^2$ (b) c = 2a

(c) $2c^2=a^2$ (d) a = 2c

Q.60. Number of maximum tangents from any point to the hyperbola $xy=c^2$ is

(a) 1 (b) 2

(c) 3 (d) 4

Q.61. Length of latus rectum of the ellipse $2x^2+y^2-8x+2y+7=0$ is

(a) $\sqrt{2}$ (b) 2

(c) 8 (d) $\sqrt{8}$

Q.62. The angle between asymptotes of hyperbola $\frac{x^2}{9}-\frac{y^2}{3}=1$ is equal to

(a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$

(c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

Q.63. If $\sqrt{3}\ bx + ay = 2ab$ touches the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ then eccentric angle θ is

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

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

Q.64. The equation of the common tangent to the curves $y^2 = 8x$ and $xy = -1$ is

(a) $3y = 9x + 2$ (b) $y = 2x + 1$

(c) $2y = x + 8$ (d) $y = x + 2$

Q.65. Let $f:(e,\infty) \to R$ be defined by $f(x) = \log(\log(\log x))$ then f is

(a) one – one onto (b) many – one onto

(c) one – one into (d) many – one into

Q.66. Number of solutions of $y = e^x$ and $y = \sin x$ is

(a) 0 (b) 1

(c) 2 (d) infinite

Q.67. The domain of the function $f(x) = \frac{1}{1 - \tan x}$ is

(a) $R \sim \left\{n\pi + \frac{\pi}{2}\right\}$ (b) $R \sim \left\{n\pi + \frac{\pi}{4}\right\}$

(c) R (d) none of these

Q.68. If $f(x+2) + f(x) = f(x+1)$ then

(a) $f(x+1) = f(x)$ (b) $f(x+1) = 2f(x)$

(c) $f(x+2) = 2f(x)$ (d) $f(x)$ is a periodic function

Q.69. The period of function $f(x) = \sin\left(\sin\frac{x}{5}\right)$ is

(a) 2π (b) $\frac{2\pi}{5}$

(c) 10π (d) 5π

Q.70. If $f(x) = In(3x - 1)$ then $f^{-1}(x)$ is given by

(a) e^{3x-1} (b) $e^{\frac{1}{3x+1}}$

(c) $\frac{1}{e^{3x-1}}$ (d) $\frac{e^x + 1}{3}$

Q.71. The range of function $f(x)=4^x+2^x+4^{-x}+2^{-x}+3$ is

(a) $\left[\frac{3}{4},\infty\right)$ (b) $\left[\frac{3}{4},\infty\right]$

(c) $(7,\infty)$ (d) $[7,\infty)$

Q.72. $\lim_{x\to 0}\frac{\log(1+x+x^2)+\log(1-x+x^2)}{\log(1+x^2)}$ is equal to

(a) 1 (b) 2

(c) 4 (d) 0

Q.73. If $f(x)=\frac{x^2+x+1}{x^2+3|x|+2}$ then $f(x)$ is

(a) continuous every where

(b) discontinuous infinite number of points

(c) discontinuous at $x=\pm 1,\pm 2$

(d) none of the above

Q.74. The value of $\lim_{x\to\infty}\frac{\operatorname{cosec}^{-1}x}{\cot^{-1}x}$ is

(a) 0 (b) 1

(c) does not exist (d) -1

Q.75. $\lim_{x\to 0}\frac{x\tan 2x-2x\tan x}{(1-\cos 2x)^2}$ is equal is

(a) 2 (b) -2

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

Q.76. $\frac{d}{dx}(x^x)$ is equal to

(a) $y\log(1+x)$ (b) $y\log x$

(c) $x^2(1-\log x)$ (d) none of the above

Q.77. $y=|x|$ then $\frac{dy}{dx}$ is equal to

(a) $\frac{|x|}{x}$ (b) 1

(c) -1 (d) none of these

Q.78. The length of the longest interval in which the function $3\sin x - 4\sin^2 x$ is increasing is

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{2}$

(c) $\frac{3\pi}{2}$ (d) π

Q.79. If $y = \sin x$ then $\frac{dy}{d(\sin x)}$ is equal to

(a) $\cos x$ (b) $\sin x \cos x$

(c) 1 (d) -1

Q.80. If $x^m y^n = (x+y)^{m+n}$ then $\frac{dy}{dx}$ is equal to

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

(c) $\frac{mx}{ny}$ (d) none of these

Q.81. $\int e^x(x^2+2x)dx$ is equal to

(a) $2e^x.x^2+c$ (b) $2x.e^x+c$

(c) $e^x.(x^2+x)+c$ (d) $e^x.x^2+c$

Q.82. $\int 5^{5^x}.5^x dx$ is equal to

(a) $\frac{5^x}{\log 5}+c$ (b) 5^x+c

(c) $\frac{5^{5^x}}{(\log 5)^2}+c$ (d) $5^{5^x}.5^x(\log 5)^2+c$

Q.83. $\int \frac{\sin 2x}{\sin^2 x + 2\cos^2 x}dx$ is equal to

(a) $\log(1+\cos^2 x)+c$ (b) $-\log x(1+\sin^2 x)+c$

(c) $\log(1+\tan^2 x)+c$ (d) $-\log(1+\cos^2 x)+c$

Q.84. $\int(x)dx$ is equal to

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

(c) $x|x|+c$ (d) $\frac{1}{2}x|x|+c$

Q.85. $\int \frac{e^x \tan^{-1}(e^x)}{1+e^{2x}} dx$ is equal to

(a) $\tan^{-1} e^x + c$ (b) $e^x + c$

(c) $\frac{1}{2}\left(\tan^{-1} e^x\right)^2 + c$ (d) none of these

Q.86. If $\int_{-1}^{4} f(x)dx = 4$ and $\int_{2}^{4}(3 - f(x))dx = 7$ then the value of $\int_{2}^{-1} f(x)dx$ is equal to

(a) 2 (b) -3

(c) -5 (d) 5

Q.87. The value of $\int_{e^{-1}}^{e^2} \left|\frac{\log_e x}{x}\right| dx$ is

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

(c) 3 (d) 5

Q.88. If $\int \frac{(2x+1)dx}{x^4 + 2x^3 + x^2 - 1} = A \log\left|\frac{x^2+x+1}{x^2+x-1}\right| + c$ then

(a) A = 1 (b) A = $\frac{1}{2}$

(c) A = $-\frac{1}{2}$ (d) A = -1

Q.89. The plane $x + y + z = 5\sqrt{3}$ and sphere $x^2 + y^2 + z^2 = 5$

(a) touch each other (b) cut in a circle

(c) meet in a straight line (d) are parallel

Q.90. The area bounded by curve $y = |4 - x^2|$ and $x - axis$ is

(a) $\frac{8}{3}$ sq. units (b) $\frac{16}{3}$ sq. units

(c) $\frac{32}{3}$ sq. units (d) $\frac{40}{3}$ sq. units

Q.91. The area bounded by curve $y = \sec^2 x, y = 0$ and $|x| = \frac{\pi}{3}$ is

(a) $\sqrt{3}$ sq. units (b) $\sqrt{2}$ sq. units

(c) $2\sqrt{3}$ sq. units (d) $2\sqrt{2}$ sq. units

Q.92. Area bounded by $|y| = x+1$ and parabola $x^2 = 8y$ and $x - axis$ is

(a) $\left(\frac{5-2\sqrt{6}}{2}\right)^2$ sq. units

(b) $\left[\frac{4-2\sqrt{6}}{24}\right]^3$ sq. units

(c) $\frac{5-2\sqrt{6}}{2} + \frac{4-2\sqrt{6}}{24}$ sq. units

(d) none of these

Q.93. The area enclosed between the –curves $y = \sin^2 x$ and $y = \cos^2 x$ in the interval $0 \le x \le \pi$ is

(a) 2 sq. units

(b) $\frac{1}{2}$ sq. units

(c) 1 sq. units

(d) $\frac{3}{2}$ sq. units

Q.94. The area bounded by $y = xe^{|x|}$ and the lines $|x| = 1, y = 0$ is

(a) 4 sq. units

(b) 6 sq. units

(c) 1 sq. units

(d) 2 sq. units

Q.95. Solution of differential equation $(2x\cos y + y^2 \cos x)dx + (2y\sin x - x^2 \sin y)dy = 0$

(a) $x^2 \sin x + y^2 \cos x = c$

(b) $x^2 \sin y + y^2 \cos x = c$

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

(d) none of these

Q.96. The position vector of three points A, B & C are $\hat{i} + \hat{j}$, $\hat{i} - \hat{j}$ and $\ell\hat{i} + m\hat{j} + nk$ respectively. The points are collinear if

(a) $\ell = m = m = 1$

(b) $\ell = 1, m, n \in R$

(c) $\ell = 1, m \in R, n = 0$

(d) $m = 0, n = 1, \ell \in R$

Q.97. $(\vec{a} \times \vec{b}) \times (\vec{a} \times \vec{c}).d$ equals

(a) $[\vec{a}\vec{b}\vec{c}](\vec{b}.\vec{d})$

(b) $[\vec{a}\vec{b}\vec{c}](\vec{a}.\vec{d})$

(c) $[\vec{a}\vec{b}\vec{c}](\vec{c}.\vec{d})$

(d) none of these

Q.98. The distance of origin from the point of intersection of lines $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and the plane $2x + y - z = 2$ is

(a) $\sqrt{120}$

(b) $\sqrt{83}$

(c) $2\sqrt{19}$

(d) $\sqrt{78}$

Q.99. The plane $x = 0$ divided the join of (-2, 3, 4) and (1, -2, 3) in the ratio

(a) 2 : 1 (b) 1 : 2

(c) 3 : 2 (d) -4 : 3

Q.100. The foot of perpendicular of point (2, 2, 2) in the plane $x + y + z = 9$ is

(a) (1, 1, 1) (b) (3, 3, 3)

(c) (9, 0, 0) (d) (2, 6, 1)

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