MATHEMATICS

61. The probability that the roots of the equation $x^2 + 2nx + \left(4n + \frac{5}{n}\right) = 0$ are not real numbers where n $\in$N such that n $\leq$ 5 is

a) 2/5 b) 4/5

c) 1/5 d) 3/5

62. If A is area lying between the curve y = cos x and x-axis between x = 0 and x = $\pi/2$, then the area of the region between the curve y = $\cos^2 x/2$ and the x-axis in the same interval is given by

a) $(\pi+A)/2$ b) $(\pi/4)+A$

c) $(\pi/2)+A$ d) $(\pi/4)+(A/2)$

63. $\int_{-1}^{1} \frac{x}{|x|} dx$ is equal to

a) 2 b) -2

c) 1 d) 0

64. If the area bounded by the curve y = f(x), x-axis and the ordinates x = 1 and x = b is (b - 1) sin(3b + 4), then f(x) is

a) [(x-1) cos (3x+4)] b) [sin(3x+4) + 3(x-1) cos(3x+4)]

c) sin (3x+4) d) None

65. The coefficient of x^{10} in the expansion of $(1 - x^3)^4 (1 + x)^5$ is

a) 15 b) 20

c) 10 d) 6

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66. Which one of the following is TRUE for any x

a) $\frac{1}{x+5} < \frac{1}{x+2} < \frac{1}{x+3}$

b) $\frac{1}{x+2} < \frac{1}{x+3} < \frac{1}{x+5}$

c) $\frac{1}{x+5} < \frac{1}{x+3} < \frac{1}{x+2}$

d) $\frac{1}{x+3} < \frac{1}{x+2} < \frac{1}{x+5}$

67. The order and degree of the differential equation $y - x\frac{dy}{dx} = \frac{a\frac{dy}{dx}}{\sqrt{1+\left(\frac{dy}{dx}\right)^2}}$ is

a) 1, 2

b) 1, 4

c) 1, 5√2

d) 1, 3

68. The general solution of the differential equation $(1 + e^{(x/y)}) dx + e^{(x/y)} (1-(x/y)) dy = 0$ is

a) $y + xe^{(x/y)}=C$

b) $x + ye^{(x/y)}=C$

c) $x + C=ye^{(x/y)}$

d) $y + ye^{(x/y)}=C$

69. The triangle with vertices A = (2, 7), B = (4, y) and C = (-2, 6) is right angled at B if the value of y is

a) 10 or -3

b) -10 or -3

c) 10 or 3

d) 9 or 4

70. The point equidistant from the three lines x + y =1, y = 1 and x = 1 is

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

b) $\left(+\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$

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

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

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71. The equation of the line mid parallel to the two lines $5x - 2y - 9 = 0$ and $5x - 2y + 7 = 0$ is

a) $x + 5y - 8 = 0$ b) $5x - y - 1 = 0$

c) $2x - 5y - 6 = 0$ d) $5x - 2y - 1 = 0$

72. The straight line $3x + 4y + 4 = 0$ is moved parallelly so that its distance from the point (3, -2) is increased by 4 units. Then its equation in the new position is

a) $3x + 4y - 30 = 0$ b) $3x + 4y - 24 = 0$

c) $3x + 4y - 21 = 0$ d) $3x + 4y + 24 = 0$

73. If a, b, c are AM, GM and HM respectively of two equal numbers, then

a) $2b = a + c$ b) $b = 2ac / (a+c)$

c) $b^2 = ac$ d) $ab^2 = c$

74. The harmonic mean of the roots of the equation is
$(7 + \sqrt{3})x^2 - (6 + \sqrt{7})x + (12 + 2\sqrt{7}) = 0$

a) 8 b) 6

c) 3 d) 4

75. The general solution of x satisfying the system of equations $5^{(\sin x + \sin y)} = 1$; $25^{(\sin 2x + \sin 2y)} = 5$ is

a) $n\pi \pm \pi/6$ b) $2n\pi + \pi/6$

c) $n\pi - (\pi/6)$ d) $n\pi + \pi/6$

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76. The angles of a triangle are in A.P and the least angle is 40°. The greatest angle in radians is

a) $\pi/2$ b) $4\pi/9$

c) $\pi/4$ d) $3\pi/2$

77. If $\sin\theta = 1/\sqrt{5}$ and $\tan\theta = 1/2$, then $\cos\theta$ is equal to

a) $2/\sqrt{5}$ b) $1/\sqrt{3}$

c) $1/\sqrt{5}$ d) $1/(2\sqrt{5})$

78. The value of $\lim_{x \to 0} (1 + x^3 + \sin x)^{4/\tan x}$ is equal to

a) 1 b) e^4

c) e d) $e^{1/4}$

79. Rolle's Theorem for $f(x) = x(x-3)e^{(-x/2)}$ is applicable in the interval

a) (0, 3) b) (0, -3)

c) (-3, 0) d) (3, 0)

80. Equation of the normal to the curve $y=(1+x)^y + \sin^{-1}(\sin^2 x)$ at $x = 0$ is

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

c) $y + x = 1$ d) $y - 1 = 2x$

81. If A and B are two matrices such that $AB = A$ and $BA = B$, then $A^2 - B^2 =$

a) 2 AB b) A − B

c) A + B d) 2 BA

82. The system of linear equations $x + 3y + (\lambda+2)z = 0$, $2x + 4y + 8z = 0$, $3x + 5y + 10z = 0$ has non-trivial solution, when λ is

a) -2 b) 2

c) 4 d) -4

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83. If the roots of the equation $ax^2 + bx + c = 0$ are in the ratio 2 : 3, then

a) $6b^2 = 25\,ac$ b) $6b^2 = 25(a+c)$

c) $13b^2 = 6\,ac$ d) $13b^2 + 6\,ac = 0$

84. If $\vec{a}$ and $\vec{b}$ are adjacent sides of a parallelogram with $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$, the adjacent sides of parallelogram are

a) perpendicular b) inclined at an angle of $\pi/3$

c) parallel d) inclined at an angle of $\pi/4$

85. The scalar $\vec{b} \cdot \{(\vec{c}+\vec{a}) \times (\vec{a}+\vec{b}+\vec{c})\}$ is equal to

a) $[\vec{a},\vec{b},\vec{c}\,]$ b) 0

c) $[\vec{a},\vec{b},\vec{c}] + [\vec{b},\vec{c},\vec{a}]$ d) $[\vec{a},\vec{b},\vec{c}] + [\vec{b},\vec{c},\vec{a}] + [\vec{c},\vec{a},\vec{b}]$

86. The equation of the line passing through the point of intersection of the lines $\frac{x-1}{1} = \frac{y-1}{0} = \frac{z-2}{1}$ and $\frac{x}{0} = \frac{y}{1} = \frac{z}{1}$ is perpendicular to the plane $5x-y+9z=10$ is

a) $\frac{x}{5} = \frac{y-1}{1} = \frac{z-1}{9}$ b) $\frac{x}{5} = \frac{y+1}{-1} = \frac{z-1}{9}$

c) $\frac{x}{5} = \frac{y+1}{-1} = \frac{z+1}{9}$ d) $\frac{x}{5} = \frac{y-1}{-1} = \frac{z-1}{9}$

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87. The equation of the plane through the intersection of the planes $2x - y + z = 6$ an $x + y + 2z = 7$ and passing through the point (1, 1, 1) is

a) $2x - 7y - 5z + 10 = 0$

b) $2x - 7y + 5z + 10 = 0$

c) $2x - 7y - 5z - 10 = 0$

d) $2x + 7y - 5z - 10 = 0$

88. The equation of the line passing through the point (1, 1, 0) and parallel to the plan $3x + 2y + z = 5$ is

a) $\frac{x-1}{-3} = \frac{y-1}{-2} = \frac{z}{1}$

b) $\frac{x+1}{3} = \frac{y+1}{2} = \frac{z}{1}$

c) $\frac{x-1}{3} = \frac{y-1}{2} = \frac{z}{1}$

d) $\frac{x-3}{1} = \frac{y-2}{1} = \frac{z-1}{0}$

89. The angle between the complex numbers $2 + 2i$ and -7 is

a) $\pi/2$

b) $\pi/4$

c) $3\pi/2$

d) $3\pi/4$

90. What is the value of $4 + 5\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{334} + 3\left(-\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{365}$?

a) i

b) $\frac{\sqrt{3}}{2}$

c) $\frac{\sqrt{3}}{2}i$

d) $\sqrt{3}i$

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91. The ratio between the number of ways we can arrange n persons in a circular manner to the number of ways we can arrange them in a line is

a) 1:n
b) n:1
c) 1:1
d) 1:2

92. A team of 8 students goes on an excursion, in two cars, of which one can seat 5 and the other only 4. In how many ways can they travel?

a) 274
b) 26
c) 126
d) 96

93. The number of common tangents to the circles $x^2 + y^2 - 4y = 0$ and $x^2 + y^2 - 2y = 0$ is

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

94. Centre of the circle passing through (4, 5), (3, 4), (5, 2) is

a) (9/2, 7/2)
b) (7/2, 9/2)
c) (7/2, 7/2)
d) (9/2, 9/2)

95. If e_1 and e_2 are the eccentricities of a hyperbola and its conjugate then $e_1^2 + e_2^2$ will be

a) 1
b) $e_1^2 e_2^2$
c) 0
d) $\frac{1}{e_1^2} + \frac{1}{e_2^2}$

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96. The equation $4x^2 + 7y^2 + 32x - 56y + 148 = 0$ represents

a) an ellipse with center (4, -4)
b) an ellipse with center (-4, 4)
c) an ellipse with center (2, -2)
d) an ellipse with center (-2, 2)

97. The equation for the circle obtained by shifting the circle $x^2 + y^2 = 49$ to 3 units down and 2 units left is:

a) $(x+3)^2 + (y+2)^2 = 49$
b) $(x-3)^2 + (y-2)^2 = 49$
c) $(x-2)^2 + (y-3)^2 = 49$
d) $(x+2)^2 + (y+3)^2 = 49$

98. The variance of a data set is k, then the variance of the data set obtained by shifting th original data to 3 units is

a) k - 3
b) k + 3
c) k
d) 3k

99. Suppose that P (A/B) = 0.7, P(A) = 0.5 and P(B) = 0.2 then P(B/A) is,

a) 0.14
b) 0.4
c) 0.3
d) 0.28

100. A medical test is capable of identifying someone with the illness as positive is 99% and someone without illness as negative 95%. If the illness is present in the general population with probability 0.0001, the probability for anyone to have illness when the medical test results positive is

a) 0.00009
b) 0.002
c) 0.0001
d) 0.9980

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