MATHS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2016

Mathematics

1. Let $f(x) = \frac{ax + b}{cx + d}$. Then the fof (x) =x provided that

A. d=-a

B. d=a

C. a=b=1

D. a=b=c=d=1

Answer: A

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2. Two finite sets have m and n elements. The number of subsets of the first set is 112 more than that of the second set. The values of m and n are, respectively.

A. 4,7

B. 7,4

C. 4,4

D. 7,7

Answer: B

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3. If A and B are positive acute angles satisfying the equalities $3\cos^2 A + 2\cos^2 B = 4$ and $\frac{3\sin A}{\sin B} = \frac{2\cos B}{\cos A}$, then $A + 2B$ is equal to

A. $\frac{\pi}{6}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{4}$

Answer: B

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4. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$ then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to

A. 0

B. 1

C. 2

D. 3

Answer: A

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5. If tan (cot x) = cot (tan x), then sin 2x is equal to :

A. $\frac{2}{(2n+1)\pi}$

B. $\frac{4}{(2n+1)\pi}$

C. $\frac{2}{n(n+1)\pi}$

D. $\frac{4}{n(n+1)\pi}$

Answer: B

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6. The general solution of the equation

$\sin 2x + 2\sin x + 2\cos x + 1 = 0$is

A. $3n\pi - \frac{\pi}{4}$

B. $2n\pi - \frac{\pi}{4}$

C. $2n\pi + (-1)^n \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

D. $n\pi - \frac{\pi}{4}$

Answer: D

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7. In a ΔABC, if $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$ and the side a = 2, then area of the triangle is

A. 1

B. 2

C. $\frac{\sqrt{3}}{2}$

D. $\sqrt{3}$

Answer: D

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8. If $\sin^{-1}\left(\frac{2a}{1+a^2}\right) - \cos^{-1}\left(\frac{1-b^2}{1+b^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then what os the value of x ?

A. a/b

B. ab

C. b/a

D. $\frac{a-b}{1+ab}$

Answer: D

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9. The arithmetic mean of numbers a, b, c,d, e is M What is the value of (a - M)+ (b-M)+ (c-M) +(d-M)+(e-M)

A. M

B. a + b + c + d + e

C. 0

D. 5 M

Answer: C

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10. The fourth term of an A.P. is equal to 3 times the first term and seventh term exceeds twice the third term by 1. find the first term and the common difference.

A. 2

B. 3

C. $\frac{3}{2}$

D. -1

Answer: A

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11. The sum of first n terms of the series $\frac{1}{2}+\frac{3}{4}+\frac{7}{8}+\frac{15}{16}$ + ...n terms

A. $n-1-2^{-n}$

B. 1

C. $n-1+2^{-n}$

D. $1+2^{-n}$

Answer: C

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12. If log a, log b, and log c are in A.P. and also log a - log 2b, log 2b - log 3c, log 3c - log a are in A.P., then

A. a, b, c, are in H.P.

B. a, 2b, 3c are in A.P.

C. a, b, c are the sides of a triangle

D. none of the above

Answer: C

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13. Find the sum to n terms of the series: $\left(x+\frac{1}{x}\right)^2+\left(x^2+\frac{1}{x^2}\right)^2+\left(x^3+\frac{1}{x^3}\right)^2+`.....$

A. $\frac{x^{2n}-1}{x^2-1}\times\frac{x^{2n+2}+1}{x^{2n}}+2n$

B. $\frac{x^{2n}-1}{x^2+1}\times\frac{x^{2n+2}-1}{x^{2n}}-2n$

C. $\frac{x^{2n}-1}{x^2-1} \times \frac{x^{2n-1}}{x^{2n}} - 2n$

D. None of these

Answer: A

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14. If $z_1 = \sqrt{3} + i\sqrt{3}$ and $z_2 = \sqrt{3} + i$, then the complex number $\left(\frac{z_1}{z_2}\right)^{50}$ lies in the :

A. first quadrant

B. second quadrant

C. third quadrant

D. fourth quadrant

Answer: A

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15. If the matrix $\begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is singular then $\lambda =$

A. -2

B. 4

C. 2

D. -4

Answer: B

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16. Let α_1, α_2 and β_1, β_2 be the roots of $ax^2 + bx + c = 0$ and $px^2 + qx + r = 0$ respectively. If the system of equations $\alpha_1 y + \alpha_2 z = 0$ and $\beta_1 y + \beta_2 z = 0$ has non-trivial solution, then $\frac{b^2}{q^2} = \frac{ac}{pr}$. True or False

A. $\frac{b^2}{q^2} = \frac{ac}{pr}$

B. $\frac{c^2}{r^2} = \frac{ab}{pq}$

C. $\frac{a^2}{p^2} = \frac{bc}{qr}$

D. None of these

Answer: A

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17. If [] denotes the greatest integer less than or equal to the real number under consideration and $-1 \leq x < 0, 0 \leq y < 1, 1 \leq z < 2,$ the value of the determinant $\begin{vmatrix} [x]+1 & [y] & [z] \\ [x] & [y]+1 & [z] \\ [x] & [y] & [z]+1 \end{vmatrix}$ is

A. $[z]$

B. [y]

C. [x]

D. None of these

Answer: A

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18. If α, β are the roots of the equations $x^2 - 2x - 1 = 0.$

Then what is the value of $\alpha^2\beta^{-2} + \alpha^{-2}\beta^2$

A. -2

B. 0

C. 30

D. 34

Answer: D

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19. If a,b and c are real numbers then the roots of the equation

$(x-a)(x-b)+(x-b)(x-c)+(x-c)(x-a)=0$

are always

A. real

B. imaginary

C. positive

D. positive

Answer: A

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20. What is $\lim_{n\to\infty}\frac{a^n+b^n}{a^n-b^n}$ where $a>b>1$, equal to?

A. -1

B. 1

C. 0

D. None

Answer: B

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21. The number of points at which the function $f(x) = \frac{1}{\log|x|}$ is discontinuous is

A. 1

B. 2

C. 3

D. 4

Answer: C

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22. If $f(x) = \begin{cases} \frac{x \log \cos x}{\log(1+x^2)}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ then f(x) is

A. continuous as well as differentiable at x = 0

B. continuous but not differentiable at x = 0

C. differentiable but not continuous at x = 0

D. neither continuous nor differentiable at x = 0

Answer: A

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23. For any differentiable function y of x, $\frac{d^2x}{dy^2}\left(\frac{dy}{dx}\right)^3 + \frac{d^2y}{dx^2} =$

A. 0

B. y

C. $-y$

D. x

Answer: A

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24. The set of all values of k for which the function $f(x) = (k^2 - 3k + 2)\left(\cos^2 \frac{x}{4} - \sin^2 \frac{x}{4}\right) + (k-1)x + \sin 1$ does not possess critical points is

A. $[1, \infty)$

B. $(0, 1) \cup (1, 4)$

C. $(-2, 4)$

D. $(1, 3) \cup (3, 5)$

Answer: B

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25. Match List I with List II and select the correct answer using the code given below the lists:

List I		List II
(A)	$f(x) = \cos x$	1. The graph cuts y-axis in infinite number of points
(B)	$f(x) = \ln x$	2. The graph cuts x -axis in two points
(C)	$f(x) = x^2 - 5x + 4$	3. The graph cuts y-axis in only one point
(D)	$f(x) = e^x$	4. The graph cuts x-axis in only one point
		5. The graph cuts x-axis in infinite number of points

Codes:

	(A)	(B)	(C)	(D)
(a)	1	4	5	3
(b)	1	3	5	4
(c)	5	4	2	3
(d)	5	3	2	4

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26. What is the x coordinate of the point on the curve f(x)= $\sqrt{x}(7x-6)$ where the tangent is parallel to x axis ?

A. $-\frac{1}{3}$

B. $\frac{2}{7}$

C. $\frac{6}{7}$

D. $\frac{1}{2}$

Answer: B

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27. A wire 34 cm long is to he bent in the form of a quadrilateral of which each angle is 90°. What is the

maximum area which can be enclosed inside the quadrilateral.

A. $68cm^2$

B. $70cm^2$

C. $71.25cm^2$

D. $72.25cm^2$

Answer: D

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28. Consider the following statement in respect of the function

$f(x) = x^3 - 1x \in [-1, 1]$

I f(X) is increasing in [-1,1]

II f(x)has no root in (-1,1]

Which of the statement given above is /are correct

A. Only I

B. Only II

C. Both I and II

D. Neither I nor II

Answer: A

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29. At an extreme point of a function f(X) the tangent to the curve is

A. parallel to the x-axis

B. perpendicular to the x-axis

C. inclined at an angle 45° to the x-axis

D. inclined at an angle 60° to the x-axis

Answer: A

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30. The curve $y = xe^x$ has minimum value equal to

A. $-\frac{1}{e}$

B. $\frac{1}{e}$

C. $-e$

D. e

Answer: A

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31. A ray of light coming from the point (1,2) is reflected at a pont A on the x-axis and then passes through the point (5,3). The co ordinate of the point A is

A. $\left(\frac{13}{5}, 0\right)$

B. $\left(\frac{5}{13}, 0\right)$

C. $(-7, 0)$

D. None of these

Answer: A

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32. The lines represented by the equation

$x^2 + 2\sqrt{3}xy + 3y^2 - 3x - 3\sqrt{3}y - 4 = 0$, are

A. a pair of intersecting lines

B. a pair of parallel lines with distance between them $\frac{5}{2}$

C. a pair of parallel lines with distance between them $5\sqrt{2}$

D. a conic section, which is not a pair of straight lines

Answer: B

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33. The line joining $(5, 0)$ to $(10\cos\theta, 10\sin\theta)$ is divided internally in the ratio $2:3$ at P then the locus of P is

A. a pair of straight lines

B. a circle

C. a straight line

D. None of these

Answer: B

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34. The number of integral values of λ for which the equation $x^2 + y^2 + \lambda x + (1 - \lambda)y + 5 = 0$ is the equation fo a circle whose radius cannot exceed $5,$ is 14 (b) 18 (c) 16 (d) none of these

A. 14

B. 18

C. 16

D. None

Answer: C

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35. The lengths of the tangents from any point on the circle

$15x^2 + 15y^2 - 48x + 64y = 0$ to the two circles

$5x^2 + 5y^2 - 24x + 32y + 75 = 0$

$5x^2 + 5y^2 - 48x + 64y = 0$ are in the ratio

A. $1:2$

B. $2:3$

C. $3:4$

D. None

Answer: A

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36. The length of the chord x + y = 3 intercepted by the circle $x^2 + y^2 - 2x - 2y - 2 = 0$ is

A. $\frac{7}{2}$

B. $3\frac{\sqrt{3}}{2}$

C. $\sqrt{14}$

D. $\frac{\sqrt{7}}{2}$

Answer: C

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37. The ,locus of the point of intersection of two perpendicular tangents to the parabola $y^2 = 4ax$ is

A. $x^2 + y^2 = a^2$

B. $ay^2 = x$

C. $x + a = 0$

D. $x + y \pm a = 0$

Answer: C

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38. The parabola having its focus at (3, 2) and directrix along the y-axis has its vertex at

A. $(2, 2)$

B. $\left(\frac{3}{2}, 2\right)$

C. $\left(\frac{1}{2}, 2\right)$

D. $\left(\frac{2}{3}, 2\right)$

Answer: B

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39. The number of values of r satisfying the equation

$^{39}C_{3r-1} - {}^{39}C_{r^2} = {}^{39}C_{r^2-1} - {}^{39}C_{3r}$ is

A. 1

B. 2

C. 3

D. 4

Answer: B

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40. If $\sum_{r=0}^{n} \frac{r+2}{r+1} {}^{n}C_{r} = \frac{2^{8}-1}{6}$, then n =

A. 8

B. 4

C. 6

D. 5

Answer: D

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41. All the words that can be formed using alphabets A, H, L, U and R are written as in a dictionary (no alphabet is repeated). Rank of the word RAHUL is

A. 71

B. 72

C. 73

D. 74

Answer: D

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42. If the sum of odd numbered terms and the sum of even numbered terms in the expansion of $(x+a)^n$ are A and B respectively, then the value of $(x^2-a^2)^n$ is

A. $A^2 - B^2$

B. $A^2 + B^2$

C. $4AB$

D. None

Answer: A

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43. If the third term in the expansion of $\left[x + x^{\log_{10} x}\right]^5$ is 10^6, then x may be

A. 1

B. $\sqrt{10}$

C. 10

D. $10^{-2/5}$

Answer: C

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44. If three vertices of a regular hexagon are chosen at random, then the chance that they form an equilateral

triangle is :

A. $\frac{1}{3}$

B. $\frac{1}{5}$

C. $\frac{1}{10}$

D. $\frac{1}{2}$

Answer: C

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45. A man takes a step forward with probability 0.4 and back ward with probability 0.6. The probability that at the end of eleven steps he is one step away from the starting point is:

A. $\frac{2^5.3^5}{5^{10}}$

B. $462 \times \left(\frac{6}{25}\right)^5$

C. $231 \times \frac{3^5}{5^{10}}$

D. none of these

Answer: B

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