



MATHS BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2016

Mathematics

1. Let
$$f(x) = rac{ax+b}{cx+d}$$
. 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



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



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



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



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

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

B. $rac{4}{(2n+1)\pi}$
C. $rac{2}{n(n+1)\pi}$
D. $rac{4}{n(n+1)\pi}$

Answer: B



6. The general solution of the equation

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

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

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

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

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

Answer: D

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7. In a
$$\triangle ABC$$
, 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



8.

$$\sin^{-1}\!\left(rac{2a}{1+a^2}
ight) - \cos^{-1}\!\left(rac{1-b^2}{1+b^2}
ight) = an^{-1}\!\left(rac{2x}{1-x^2}
ight)$$
,

then what os the value of x?

A. a/b

B. ab

C. b/a

D.
$$rac{a-b}{1+ab}$$

Answer: D



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



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

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

D. -1

Answer: A



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

$$\left(x + \frac{1}{x}\right)^{2} + \left(x^{2} + \frac{1}{x^{2}}\right)^{2} + \left(x^{3} + \frac{1}{x^{3}}\right)^{2} + \dots$$
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.
$$rac{x^{2n}-1}{x^2-1} imesrac{x^{2n-1}}{x^{2n}}-2n$$

D. None of these

Answer: A



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

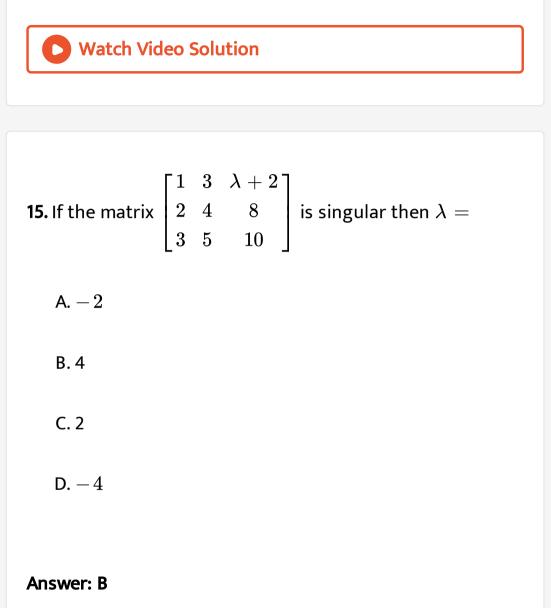
A. first quadrant

B. second quadrant

C. third quadrant

D. fourth quadrant

Answer: A



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16. Let α_1, α_2 and β_1, β_2 be the roots of $ax^2+bx+c=0 \,\, {
m and} \,\, px^2+qx+r=0 \,\,$ 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 $\displaystyle rac{b^2}{a^2} = \displaystyle rac{ac}{pr}$. True or False A. $rac{b^2}{q^2} = rac{ac}{pr}$ $\mathsf{B}.\frac{c^2}{r^2} = \frac{ab}{pq}$ C. $\frac{a^2}{n^2} = \frac{bc}{ar}$

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 $-1 \le x < 0, 0 \le y < 1, 1 \le z < 2$, the value of the determinant $\begin{vmatrix} x \\ x \end{vmatrix} + 1 \quad \begin{bmatrix} y \\ y \end{bmatrix} + 1 \quad \begin{bmatrix} z \\ z \end{bmatrix}$ $\begin{vmatrix} z \\ z \end{vmatrix}$ is $\begin{bmatrix} x \\ y \end{bmatrix} \quad \begin{bmatrix} y \end{bmatrix} + 1 \quad \begin{bmatrix} z \\ z \end{bmatrix} + 1 \begin{vmatrix} z \\ z \end{bmatrix}$

A. $\left[z
ight]$

B. [y]

C. [x]

D. None of these

Answer: A



18. If lpha,eta are the roots of the equations $x^2-2x-1=0.$ Then what is the value of $lpha^2eta^{-2}+lpha^{-2}eta^2$

 $\mathsf{A.}-2$

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

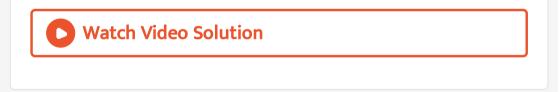
A. real

B. imaginary

C. positive

D. positive

Answer: A



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

 $\mathsf{A.}-1$

B. 1

C. 0

D. None

Answer: B

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

A. 1

B. 2

C. 3

Answer: C

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22. If
$$f(x)=\left\{egin{array}{c} rac{x\log\cos x}{\log\left(1+x^2
ight)}, & x
eq 0\ 0, & x=0 \end{array}
ight.$$
 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

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



24. The set of all values of k for which the function $f(x) = \left(k^2 - 3k + 2\right) \left(\cos^2\frac{x}{4} - \sin^2\frac{x}{4}\right) + (k-1)x + \sin 1$ 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



25. Match List I with List II and select the correct answer

using the code given below the lists:

(A)	List I $f(x) = cc$	is x	1.	List II The graph cuts y-axis
				in infinite number of points
one en Les c	$f(x) = \ln x$			The graph cuts x -axis in two points
(C)	$f(x) = x^{2}$	$^{2}-5x+4$	3.	The graph cuts y-axis in only one point
(D)	$f(x) = e^{3}$	с .	4.	The graph cuts x-axis in only one point
			5.	The graph cuts x-axis in infinite number of
				points
Codes:				
	(A)	(B)	(\mathbf{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



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. $68 cm^2$

 $\mathsf{B.}\,70cm^2$

 $\mathsf{C.}\,71.25 cm^2$

D. $72.25 cm^2$

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

Answer: A



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



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



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



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



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

 $\mathsf{A.}\,1\!:2$

B. 2:3

C.3:4

D. None

Answer: A



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



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

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

$$\mathsf{B.}\,ay^2=x$$

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.
$$(2, 2)$$

$$B.\left(\frac{3}{2},2\right)$$
$$C.\left(\frac{1}{2},2\right)$$

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

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



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



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



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. $A^2 B^2$
- $\mathsf{B}.\,A^2+B^2$
- C.4AB
- D. None

Answer: A



43. If the third term in the expansion of $\left[x+x^{\log_{10}x}
ight]^5$ 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 :

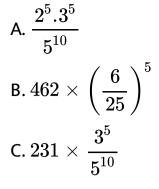
A.
$$\frac{1}{3}$$

B. $\frac{1}{5}$
C. $\frac{1}{10}$
D. $\frac{1}{2}$

Answer: C



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:



D. none of these

Answer: B

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