# MATHS

## BOOKS - BITSAT GUIDE

## QUESTION-PAPERS-2018

**Mathematics**

**1.** The domain of the function $f(x) = \sqrt{x^2 - [x]^2}$, where $[x]$ is the greatest integer less than or equal to $x$, is $R$ (b) $[0, +\infty]$ $(-\infty, 0)$ (d) none of these

A. $(0, \infty)$

B. $(-\infty, 0)$

C. $(-\infty, \infty)$

D. None of these

**Answer: D**

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**2.** If $m \sin\theta = n \sin(\theta + 2\alpha)$ then $\tan(\theta + \alpha)$ is

A. $\frac{m+n}{m-n}\tan\alpha$

B. $\frac{m+n}{m-n}\tan\theta$

C. $\frac{m+n}{m-n}\cot\alpha$

D. $\frac{m+n}{m-n}\cot\theta$

**Answer: A**

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**3.** Number of solutions of equation $\sin 9\theta = \sin\theta$ in the interval $[0, 2\pi]$ is

A. 16

B. 17

C. 18

D. 15

**Answer: B**

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**4.** A pole stands vertically , inside a triangular park $\triangle ABC$. If the angle of elevation of the top of the pole from each corner of the park is same, then in $\triangle ABC$ the foot of the pole is at the

A. centroid

B. circumcentre

C. incentre

D. orthocentre

**Answer: A**

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**5.** Let A, B, and C are the angles of a plain triangle and $\tan\frac{A}{2}=\frac{1}{3},\tan\frac{B}{2}=\frac{2}{3}.$ Then $\tan\frac{C}{2}$ is equal to

A. $7/9$

B. $2/9$

C. $1/3$

D. $2/3$

**Answer: A**

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**6.** If the amplitude of $z-2-3i$ is $\pi/4$, then the locus of $z=x+iy$ is

A. $x+y-1=0$

B. $x-y-1=0$

C. $x+y+1=0$

D. $x-y+1=0$

**Answer: D**

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**7.** The roots of the equation $x^4-2x^3+x-380=0$ are

A. $5,\ -4,\ \frac{1\pm5\sqrt{-3}}{2}$

B. $-5,\ 4,\ \frac{-1\pm5\sqrt{-3}}{2}$

C. $5,\ 4,\ \frac{-1\pm5\sqrt{-3}}{2}$

D. $-5, \ -4, \frac{1 \pm 5\sqrt{-3}}{2}$

**Answer: A**

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**8.** Roots of the equation $x^2 + bx - c = 0 (b, c > 0)$ are

A. Both positive

B. Both negative

C. Of opposite sign

D. None of these

**Answer: C**

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**9.** In how many ways can 12 gentlemen sit around a round table so that three specified gentlemen are always together?

A. $9!$

B. $10!$

C. $3!10!$

D. $3!9!$

**Answer: D**

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**10.** The number of ways in which first, second and third prizes can be given to 5 competitors is

A. 10

B. 60

C. 15

D. 125

**Answer: B**

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**11.** The coefficient of $x^3$ in the expansion of $\left(x - \frac{1}{x}\right)^7$ is:

A. 14

B. 21

C. 28

D. 35

**Answer: B**

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**12.** If $x > 0,$ then $1 + \frac{\log_{e^2} x}{1!} + \frac{(\log_{e^2} x)^2}{2!} \ldots\ldots$

A. $x$

B. $x^2$

C. 2x

D. $\sqrt{x}$

**Answer: D**

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**13.** If a, b, c are in G.P., then

A. $a^2, b^2, c^2$ are in G.P.

B. $a^2(b+c), c^2(a+b), b^2(a+c)$ are in G.P.

C. $\frac{a}{b+c}, \frac{b}{c+a}, \frac{c}{a+b}$ are in G.P.

D. None of these

**Answer: A**

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**14.** The locus of the point of intersection of the lines $x = a\left(\frac{1-t^2}{1+t^2}\right)$ and $y = \frac{2at}{1+t^2}$ represent (t being a parameter)

A. circle

B. parabola

C. ellipse

D. hyperbola

**Answer: A**

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**15.** The equation of the circle which passes through the point (4, 5) and has its centre at (2, 2) is .....

A. $(x-2)+(y-2)=13$

B. $(x-2)^2+(y-2)^2=13$

C. $(x)^2+(y)^2=13$

D. $(x-4)^2+(y-5)^2=13$

**Answer: B**

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**16.** Eccentricity of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ if it passes through point (9, 5) and (12, 4) is

A. $\sqrt{3/4}$

B. $\sqrt{4/5}$

C. $\sqrt{5/6}$

D. $\sqrt{6/7}$

**Answer: D**

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**17.** Consider the equation of a parabola $y^2 + 4ax = 0,$ where $a > 0.$

Which of the following is false ?

A. Tangent at the vertex is x = 0

B. Directrix of the parabola is x = 0

C. Vertex of the parabola is not at the origin

D. Focus of the parabola is at (a, 0)

**Answer: D**

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**18.** The value of $\lim_{n \to \infty} \frac{1+2+3+\ldots n}{n^2+100}$ is equal to :

A. $\infty$

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

C. 2

D. 0

**Answer: A**

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**19.** $\lim_{x \to 0} \sqrt{\frac{x - \sin x}{x + \sin^2 x}}$

A. 1

B. 0

C. $\infty$

D. None of these

**Answer: B**

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**20.** The probability of getting 10 in a single throw of three fair dice is

A. $\frac{1}{6}$

B. $\frac{1}{8}$

C. $\frac{1}{9}$

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

**Answer: B**

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**21.** A solution of the equation

$\tan^{-1}(1+x)+\tan^{-1}(1-x)=\frac{\pi}{2}$ is

A. 3

B. 2

C. 1

D. 0

**Answer: C**

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**22.** If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is an orthogonal matrix, then

A. a = – 2, b = – 1

B. a = 2, b = 1

C. a = 2, b = – 1

D. a = – 2, b = 1

**Answer: A**

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**23.** The points represented by the complex numbers $1+i, -2+3i$ and $\frac{5}{3}i$ on the argand diagram are

A. vertices of an equilateral triangle

B. vertices of an isosceles triangle

C. collinear

D. None of these

**Answer: C**

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**24.** If matrix $A = \begin{bmatrix} 3 & 2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{bmatrix}$ and $A^{-1} = \frac{1}{k}$ adj A, then k is

A. 7

B. -7

C. 15

D. -11

**Answer: C**

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**25.** If x,y,z are complex numbers , then $\Delta = \begin{vmatrix} 0 & -y & -z \\ \bar{y} & 0 & -x \\ \bar{z} & \bar{x} & 0 \end{vmatrix}$ is equal to

A. purely real

B. purely imaginary

C. complex

D. 0

**Answer: B**

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**26.** If $f(x) = \{(\sin x; x \text{ rational}) \ (\cos x; x \text{ is irrational})$ then the function is

A. discontinuous at $x = n\pi + \pi/4$

B. continuous at $x = n\pi + \pi/4$

C. discontinuous at all x

D. none of these

**Answer: B**

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**27.** If : f(x) $= 1, \quad \ldots \ 0 < x \leq \frac{3\pi}{4}$

$= 2.\sin\left(\frac{2x}{9}\right), \quad \ldots \frac{3\pi}{4} < x < \pi$

then :

A. f (x) is continuous at x = 0

B. f (x) is continuous at $x = \pi$

C. f(x) is continuous at $x = \frac{3\pi}{4}$

D. f(x) is discontinuous at $x = \frac{3\pi}{4}$

**Answer: C**

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**28.** The value of c in (0, 2) satisfying the mean value theorem for the function $f(x) = x(x-1)^2, x \in [0, 2]$ is equa to

A. $\frac{3}{4}$

B. $\frac{4}{3}$

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

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

**Answer: B**

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**29.** If $y = \frac{x}{x+1} + \frac{x+1}{x}$, then $\frac{d^2y}{dx^2}$ at x=1 is equal to

A. $\frac{7}{4}$

B. $\frac{7}{8}$

C. $\frac{1}{4}$

D. $\frac{-7}{8}$

**Answer: A**

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**30.** If $y = e^{2x}$, then $\frac{d^2y}{dx^2} \cdot \frac{d^2x}{dy^2}$ is equal to

A. 1

B. $e^{-2x}$

C. $2e^{-2x}$

D. $-2e^{-2x}$

**Answer: D**

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**31.** A ball is dropped from a platform 19.6m high. Its position function is

A. $x = -4.9t^2 + 19.6(0 \le t \le 1)$

B. $x = -4.9t^2 + 19.6(0 \le t \le 2)$

C. $x = -9.8t^2 + 19.6(0 \le t \le 2)$

D. $x = -4.9t^2 - 19.6(0 \le t \le 2)$

**Answer: B**

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**32.** The value of the integral $\int_a^b \frac{\sqrt{x}dx}{\sqrt{x} + \sqrt{1+b-x}}$ is

A. $\pi$

B. $\frac{1}{2}(b-a)$

C. $\pi/2$

D. $b-a$

**Answer: B**

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**33.** $\int \frac{e^{x^2}\left(2x+x^3\right)}{\left(3+x^2\right)^2}dx$ is equal to :

A. $\frac{e^{x^2}}{\left(3+x^2\right)}+k$

B. $\frac{1}{2}\frac{e^{x^2}}{\left(3+x^2\right)^2}+k$

C. $\frac{1}{4}\frac{e^{x^2}}{\left(3+x^2\right)^2}+k$

D. $\frac{1}{2}\frac{e^{x^2}}{\left(3+x^2\right)}+k$

**Answer: D**

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**34.** If $\int_0^a f(2a-x)dx = m$ and $\int_0^a f(x)dx = n$, then $\int_0^{2a} f(x)dx$ is equal to

A. $2m+n$

B. $m+2n$

C. $m-n$

D. $m+n$

**Answer: D**

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**35.** An integrating factor of the differential equation

$\sin x \frac{dy}{dx} + 2y\cos x = 1$ is

A. $\sin^2 x$

B. $\frac{2}{\sin x}$

C. $\log|\sin x|$

D. $\frac{1}{\sin^2 x}$

**Answer: A**

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**36.** The expression satisfying the differential equation $\left(x^2-1\right)\frac{dy}{dx}+2xy=1$ is

A. $x^2y-xy^2=c$

B. $\left(y^2-1\right)x=y+c$

C. $\left(x^2-1\right)y=x+c$

D. None of these

**Answer: C**

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**37.** Let $\vec{a} = \hat{i} - \hat{k}$, $\vec{b} = x\hat{i} + \hat{j} + (1-x)\hat{k}$ and $\vec{c} = y\hat{I} + x\hat{j} + (1+x-y)\hat{k}$. Then $\left[\vec{a}, \vec{b}, \vec{c}\right]$ depends on

A. only y

B. only x

C. both x and y

D. neither x nor y

**Answer: D**

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**38.** If $\hat{i} + \hat{j}, \hat{j} + \hat{k}, \hat{i} + \hat{k}$ are the position vectors of the vertices of a $\Delta ABC$ taken in order, then $\angle A$ is equal to

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

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

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

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

**Answer: D**

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**39.** The projection of line joining (3, 4, 5) and (4, 6, 3) on the line joining (–1, 2, 4) and (1, 0, 5) is

A. $\frac{4}{3}$

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

C. $\frac{8}{3}$

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

**Answer: A**

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**40.** Which of the following statements is correct?

A. Every L.P.P. admits an optimal solution.

B. A L.P.P. admits a unique optimal solution.

C. If a L.P.P. admits two optimal solutions, it has an infinite number of optimal solutions

D. The set of all feasible solutions of a L.P.P. is not a convex set.

**Answer: C**

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**41.** If the constraints in a linear programming problem are changed

A. The problem is to be re-evaluated

B. Solution is not defined.

C. The objective function has to be modified.

D. The change in constraints is ignored.

**Answer: A**

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**42.** In a binomial distribution, the mean is 4 and variance is 3. Then its mode is

A. 5

B. 6

C. 4

D. None of these

**Answer: C**

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**43.** The sum $1+\frac{1+a}{2!}+\frac{1+a+a^2}{3!}+\ldots.\infty$ is equal to

A. $e^a$

B. $\frac{e^a-e}{a-1}$

C. $(a-1)e^a$

D. $(a+1)e^a$

**Answer: B**

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**44.** The Boolean expression $\sim(p\vee q)\vee(\sim p\wedge q)$ is equivalent to :

A. p

B. q

C. $\sim q$

D. $\sim p$

**Answer: D**

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**45.** If in a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is approximately

A. 25.5

B. 24.0

C. 22.0

D. 20.5

**Answer: B**

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