MATHS

BOOKS - BITSAT GUIDE

QUESTION-PAPERS-2015

Mathematics

1. $\lim_{x \to \infty} \frac{\int_0^{2x} x e^{x^2}}{e^{4x^2}}$ equals

A. 0

B. ∞

C. 2

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

Answer: D

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2. If ω is the complex cube root of unity, then the value of $\omega + \omega\left(\frac{1}{2} + \frac{3}{8} + \frac{9}{32} + \frac{27}{128} + \ldots\ldots\ldots\right)$,

A. -1

B. 1

C. $-i$

D. i

Answer: A

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3. The root of the equation $2(1+i)x^2 - 4(2-i)x - 5 - 3i = 0$, where $i = \sqrt{-1}$, which has greater modulus is

A. $\frac{3-5i}{2}$

B. $\frac{5-3i}{2}$

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

D. none

Answer: A

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4. $\frac{3}{4} + \frac{15}{16} + \frac{63}{64} + \ldots\ldots\ldots nterms$

A. $n - \frac{4^n}{3} - \frac{1}{3}$

B. $n + \frac{4^{-n}}{3} - \frac{1}{3}$

C. $n + \frac{4^{n}}{3} - \frac{1}{3}$

D. $n - \frac{4^{-n}}{3} + \frac{1}{3}$

Answer: B

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5. The period of $\tan 3\theta$ is

A. π

B. $3\pi/4$

C. $\pi/2$

D. None of these

Answer: D

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6. If a function $f(x)$ is given by

$$f(x) = \frac{x}{1+x} + \frac{x}{(x+1)(2x+1)} + \frac{x}{(2x+1)(3x+1)} + \ldots\infty$$

then at $x = 0$, $f(x)$

A. has no limit

B. is not continuous

C. is continuous but not differentiable

D. is differentiable

Answer:

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7. If g is inverse of function f and $f'(x) = \sin x$, then $g'(x)$=

A. cosec {g(x)}

B. sin {g(x)}

C. $\frac{1}{\sin\{g(x)\}}$

D. None of these

Answer: C

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8. A bag contains (2n + 1) coins. It is known that n of these coins have a head on both sides, whereas the remaining (n + 1) coins are fair. A coin is picked up at random from the bag

and tossed. If the probability that the toss results in a head is 31/42, then n is equal to

A. 10

B. 11

C. 12

D. 13

Answer: A

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9. If $\phi(x)$ is a differentiable function, then the solution of the different equation $dy + \{y\phi'(x) - \phi(x)\phi'(x)\}dx = 0,$ is

A. $y = \{\phi(x) - 1\} + Ce^{-\phi(x)}$

B. $y\phi(x) = \{\phi(x)\}^2 + C$

C. $ye^{\phi(x)} = \phi(x)e^{\phi(x)} + C$

D. $y - \phi(x) = \phi(x)e^{-\phi(x)}$

Answer: A

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10. The area of the region $R = \{(x, y) : |x| \leq |y| \text{ and } x^2 + y^2 \leq 1\}$ is

A. $\frac{3\pi}{8}$ sq units

B. $\frac{5\pi}{8}$ sq units

C. $\frac{\pi}{2}$ sq units

D. $\frac{\pi}{8}$ sq units

Answer: C

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11. Universal set $U = \{x \mid x^5 - 6x^4 + 11x^3 - 6x^2 = 0\}$

$A = \{x \mid x^2 - 5x + 6 = 0\}$ $B = \{x \mid x^2 - 3x + 2 = 0\}$

What is $(A \cap B)$ 'equal to?

A. {1, 3}

B. {1, 2, 3}

C. {0, 1, 3}

D. {0, 1, 2, 3}

Answer: C

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12. If $\cot^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$, then $4x^2 - 4xy\cos\alpha + y^2$ is equal to :

A. $2\sin 2\alpha$

B. 4

C. $4\sin^2\alpha$

D. $-4\sin^2\alpha$

Answer: C

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13. If $\frac{e^x + e^{5x}}{e^{3x}} = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \ldots.$ then the value of $2a_1 + 2^3 a_3 + 2^5 a_5 + \ldots\ldots$ is

A. $e^2 + e^{-2}$

B. $e^4 - e^{-4}$

C. $e^4 + e^{-4}$

D. 0

Answer: D

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14. Let a, b and c be three vectors satisfying $a \times b = (a \times c), |a| = |c| = 1, |b| = 4$ and $|b \times c| = \sqrt{15}.$

If $b - 2c = \lambda a$, then λ equals

A. 1

B. -1

C. 2

D. ± 4

Answer: D

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15. The total number of 4 digit numbers in which the digit are in descending order, is

A. ${}^{10}C_4 \times 4!$

B. ${}^{10}C_4$

C. $\frac{10!}{4!}$

D. None of these

Answer: B

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16. The line, which is parallel to X-axis and crosses the curve $y = \sqrt{x}$ at an angle 45°, is

A. $x = \frac{1}{4}$

B. $y = \frac{1}{4}$

C. $y = \frac{1}{2}$

D. $y = 1$

Answer: C

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17. In a triangle, the lengths of the two larger sides are 10 and 9, respectively. If the angles are in A.P., then the length of the third side can be $5-\sqrt{6}$ (b) $3\sqrt{3}$ (c) 5 (d) $5+\sqrt{6}$

A. $5 \pm \sqrt{6}$

B. $3\sqrt{3}$

C. 5

D. None of these

Answer: A

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18. The mean of then Numbers 0,1,2,3.....n with respective weights ${}^{n}C_0, {}^{n}C_1, {}^{n}C_2 \ldots\ldots . {}^{n}C_n$ is

A. n

B. $\frac{2^n}{n}$

C. $n+1$

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

Answer: D

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19. The mean square deviation of a set of n observation $x_1, x_2, \ldots . x_n$ about a point c is defined as $\frac{1}{n}\sum_{i=1}^{n}(x_i - c)^2$. The mean square deviations about – 2 and 2 are 18 and 10 respectively, the standard deviation of this set of observations is

A. 3

B. 2

C. 1

D. None of these

Answer: A

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20. Let S be the focus of the parabola $y^2 = 8x$ and let PQ be the common chord of the circle $x^2 + y^2 - 2x - 4y = 0$ and the given parabola. The area of the triangle PQS is

A. 4 sq units

B. 3 sq units

C. 2 sq units

D. 8 sq units

Answer: A

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21. The number of real root of the equation $e^{x-1} + x - 2 = 0$, is

A. 1

B. 2

C. 3

D. 4

Answer: A

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22. Minimise $Z = \sum_{j=1}^{n} \sum_{i=1}^{m} c_{ij} x_{ij}$ Subject to $\sum_{i=1}^{m} x_{ij} = b_j, j = 1, 2, \ldots . , n \sum_{j=1}^{n} x_{ij} = b_j, i = 1, 2, \ldots . , m$ is a LPP with number of constraints

A. $m - n$

B. mn

C. $m + n$

D. $\frac{m}{n}$

Answer: C

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23. A bag contains 3 red and 3 white balls. Two balls are drawn one by one. The probability that they are of different colours is.

A. $3/10$

B. $2/5$

C. $3/5$

D. None of these

Answer: C

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24. If M be a 3×3 non-singular matrix with $\det(M) = \alpha$.If $M^{-1}adj(adjA) = KI$, then the value of K is

A. 1

B. α

C. α^2

D. α^3

Answer: B

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25. Tangents are drawn from the origin to the curve $y = \cos X$. Their points of contact lie on

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

B. $x^2y^2 = x^2 + y^2$

C. $x^2y^2 = x^2 - y^2$

D. None of these

Answer: C

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26. The slope of the tangent to the curve $y = e^x \cos x$ is minimum at $x = a, 0 \leq a \leq 2\pi$, then the value of a is

A. 0

B. π

C. 2π

D. $3\pi / 2$

Answer: B

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27. Two lines $L_1 : x = 5, \frac{y}{3-\alpha} = \frac{z}{-2}$ $L_2 : x = \alpha, \frac{y}{-1} = \frac{z}{2-\alpha}$ are coplanar. Then, α can take value (s)

A. 1, 4, 5

B. 1, 2, 5

C. 3, 4, 5

D. 2, 4, 5

Answer: A

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28. The eccentricity of an ellipse with its centre at the origin is $\frac{1}{2}$. If one of the directrices is x = 4 , then the equation of ellipse is

A. $4x^2 + 3y^2 = 1$

B. $3x^2 + 4y^2 = 12$

C. $4x^2 + 3y^2 = 12$

D. $3x^2 + 4y^2 = 1$

Answer: B

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29. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minimum at $x = 2$ (b) $x = -2$ $x = 0$ (d) $x = 1$

A. $x = 2$

B. $x = -2$

C. $x = 0$

D. $x = 1$

Answer:

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30. If $y = \left(x + \sqrt{1 + x^2}\right)^n$ then $\left(1 + x^2\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$

A. n^2y

B. $-n^2y$

C. $-y$

D. $2x^2y$

Answer: A

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31. If $\lim_{x \to \infty} x \sin\left(\frac{1}{x}\right) = A$ and $\lim_{x \to 0} x \sin\left(\frac{1}{x}\right) = B$, then which one of the following is correct?

A. A =1 and B = 0

B. A =0 and B = 1

C. A =0 and B = 0

D. A =1 and B = 1

Answer: A

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32. If a and b $(\neq 0)$ are the roots of the quadratic $x^2 + ax + b = 0$ then the least value of $x^2 + ax + b(x \in R)$ is

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

B. $-\frac{9}{4}$

C. $\frac{9}{4}$

D. 1

Answer: B

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33. $If 0 < x < \frac{\pi}{2}$ then

A. $\tan x < x < \sin x$

B. $x < \sin x < \tan x$

C. $\sin x < \tan x < x$

D. None of these

Answer: D

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34. The degree of the differential equation satisfying $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$, is

A. 1

B. 2

C. 3

D. 4

Answer: A

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35. Let f(x) be a polynomial of degree three $f(0) = -1$ and $f(1) = 0$. Also, 0 is a stationary point of $f(x)$. If f(x) does not have an extremum at $x = 0$, then the value of integral $\int \frac{f(x)}{x^3 - 1} dx$, is

A. $\frac{x^2}{2} + C$

B. $x + C$

C. $\frac{x^3}{6} + C$

D. None of these

Answer: B

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36. The domain of the function $f(x) = \frac{\sin^{-1}(x-3)}{\sqrt{9-x^2}}$, is

A. [1, 2]

B. [2, 3)

C. [1, 2]

D. [2, 3]

Answer: B

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37. If the lines $p_1x + q_1y = 1 + q_2y = 1$ and $p_3x + q_3y = 1$ be concurrent, show that the point

$(p_1, q_1), (p_2, q_2)$ and (p_3, q_3) are collinear.

A. are collinear

B. form an equilateral triangle

C. form a scalene triangle

D. form a right angled triangle

Answer: A

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38. Area of the circle in which a chord of length $\sqrt{2}$ makes an angle $\frac{\pi}{2}$ at the centre,

A. $\pi/2$ sq units

B. 2π sq units

C. π sq units

D. $\pi/4$ sq units

Answer: C

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39. If $\frac{\cos A}{\cos B} = n$ and $\frac{\sin A}{\sin B} = m, then\left(m^2 - n^2\right)\sin^2 B =$

A. $1 + n^2$

B. $1 - n^2$

C. n^2

D. $-n^2$

Answer: B

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40. If complex number Z_1, Z_2 and 0 are vertices of equilateral triangle, then $Z_1^2 + Z_2^2 - Z_1 Z_2$ is equal to

A. 0

B. $Z_1 - Z_2$

C. $Z_1 + Z_2$

D. 1

Answer: A

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41. If $\rho = \{(x, y) \mid x^2 + y^2 = 1, x, y \in A\}$.Then , ρ is

A. reflexive

B. symmetric

C. transitive

D. anti-symmetric

Answer: B

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42. A line line makes the same angle θ with each of the x and z-axes. If the angle β, which it makes with y-axis, is such that $\sin^2\beta = 3\sin^2\theta$ then $\cos^2\theta$ equals

A. $2/5$

B. $1/5$

C. $3/5$

D. $2/3$

Answer: C

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43. If in a binomial distribution $n = 4,\ P(X = 0) = \frac{16}{81},\ then\ P(X = 4)$ equals $\frac{1}{16}$ b. $\frac{1}{81}$ c. $\frac{1}{27}$ d. $\frac{1}{8}$

A. $\frac{1}{16}$

B. $\frac{1}{81}$

C. $\frac{1}{27}$

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

Answer: B

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44. Let $f: R \to R$ be a function such that $f(x+y) = f(x) + f(y) \text{for all}, x, y \in R$

If f(x) is differentiable at x=0. then, which one of the following is incorrect?

A. f(x) is continuous, $\forall x \in R$

B. f'(x) is constant, $\forall x \in R$

C. f(x) is differentiable, $\forall x \in R$

D. f(x) is differentiable only in a finite interval containing zero.

Answer: D

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45. If binomial coeffients of three consecutive terms of $(1+x)^n$ are in H.P., then the maximum value of n, is

A. 1

B. 2

C. 0

D. None of these

Answer:

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