MATHS

BOOKS - BITSAT GUIDE

SOLVED PAPER 2018

Mathematics Part Iv

1. The coefficient of x^{-n} in $(1+x)^n\left(1+\frac{1}{x}\right)^n$ is

A. 0

B. 1

C. 2^n

D. 2n

Answer: B

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2. Find the value of the greatest term in the expansion of $\sqrt{3}\left(1+\frac{1}{\sqrt{3}}\right)^{20}$.

A. $\frac{26840}{9}$

B. $\frac{24840}{9}$

C. $\frac{25840}{9}$

D. None of these

Answer: C

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3. nth roots of Unity

A. AP

B. GP

C. HP

D. None of these

Answer: B

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4. If $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$, $abc = 1$, $A^T A = I$, then find the value of $a^3 + b^3 + c^3$.

A. 2

B. 1

C. 0

D. 5

Answer: A

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5. If $x^2 = \begin{vmatrix} \sin\theta & \cos\theta & 0 \\ -\cos\theta & \sin\theta & 1 \\ \sin\theta & \cos\theta & 2 \end{vmatrix}$, then the value of $4x^2 + x\sin\frac{3\pi}{2} + 5$ is

A. $13 - \sqrt{2}$

B. $13 + \sqrt{2}$

C. $\sqrt{2} - 13$

D. Both a and b

Answer: D

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6. The sides a,b,c of ΔABC are in G.P., where loga-log2b,log2b-log3c,log3c-loga are in A.P., then the ΔABC is

A. equilateral

B. right angled

C. acute angled

D. obtuse angled

Answer: D

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7. If $\Sigma_{r=1}^{n} t_r = \frac{n(n+1)(n+2)(n+3)}{8}$, where t_r denotes the rth term of a series, then $\lim_{n \to \infty} \Sigma_{r=1}^{n} \frac{1}{t_r}$ is

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

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

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

D. 1

Answer: C

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8. Which of the following statement is a tautology?

A. $(p \vee q) \vee (\sim p)$

B. $(\sim q \wedge p) \vee (p \vee \sim p)$

C. Both a and b

D. None of the above

Answer: C

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9. A parallelogram is cut by two sets of m lines parallel to its sides. The number of parallelogram then formed is

A. ${}^{m}C_2 \times {}^{m}C_2$

B. $2\left({}^{m+2}C_2\right)$

C. $\left({}^{m+2}C_2\right)^2$

D. None of these

Answer: C

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10. The inverse of the functions $f(x) = \log_2\left(x + \sqrt{x^2 + 1}\right)$ is

A. $\frac{1}{2}\left(a^x - a^{-x}\right)$

B. not defined for all x

C. defined for $x > 0$

D. none of these

Answer: A

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11. The value of $S = \Sigma_{n=1}^{\infty} \tan^{-1} \frac{2n}{n^4 + n^2 + 2}$ is equal to

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

B. π

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

D. None of these

Answer: C

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12. For what value of k the equation $\sin x + \cos(k + x) + \cos(k - x) = 2$ has real solutions?

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

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

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

D. $\frac{-3}{4}$

Answer: A

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13. A line makes angles α, β, γ with the coordinate axes. If $\alpha + \beta = \frac{\pi}{2}$, then $(\cos\alpha + \cos\beta + \cos\gamma)^2$ is equal to

A. $1 + \cos 2\alpha$

B. $1 - \sin 2\alpha$

C. $1 + \sin 2\alpha$

D. None of these

Answer: C

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14. Straight lines $3x + 4y = 5$ and $4x - 3y = 15$ intersect at the point A. If point B and C are chosen on these two lines such that AB= AC, then the possible equation of the line BC passing through the point (1,2) is

A. $x + 7y + 13 = 0$ or $7x + y + 9 = 0$

B. $x + 7y + 13 = 0$ or $7x + 2y + 7 = 0$

C. $x - 7y + 13 = 0$ or $7x + y - 9 = 0$

D. None of these

Answer:

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15. Normals drawn to $y^2 = 4ax$ at the points where it is intersected by the line $y = mx + c$ intersected at P. Coordinates of foot of the another normal drawn to the parabola from the point 'P' is

A. $\left(\frac{a}{m^2}, -\frac{2a}{m}\right)$

B. $\frac{9}{m}, -\frac{6a}{m}$

C. $(am^2, -2am)$

D. $\left(\frac{4a}{m^2}, -\frac{4a}{m}\right)$

Answer: D

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16. The area of the triangle formed by joining the origin to the point of intersection of the line $x\sqrt{5}+2y=3\sqrt{5}$ and the circle $x^2+y^\circ=10$ is 3 (b) 4 (c) 5 (d) 6

A. 3

B. 4

C. 5

D. 6

Answer: C

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17. Radius of the largest circle passing through the focus of the parabola $y^2=4x$ and lying inside the parabola is...

A. 8

B. 4

C. 2

D. 5

Answer: B

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18. A tangent drawn to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at $P\left(\frac{\pi}{6}\right)$ forms a triangle of area $3a^2$ square units, with coordinate axes. If the eccentricity of hyperbola is e, then the value of $e^2 - 9$ is

A. 9

B. 10

C. 11

D. 8

Answer: D

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19. If the sum of squares of distances of a point from the planes $x + y + z = 0, x - z = 0$ and $x - 2y + z = 0$ is p^2, then locus of the point is

A. $x^2 + z^2 = p^2$

B. $x^2 + 2xy + y^2 + z^2 = p^2$

C. $x + y + z = p^2$

D. $x^2 + y^2 + z^2 = p^2$

Answer: D

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20. Line $\frac{(x+1)}{\lambda} = y - 1 = \frac{(z+2)}{-4}$ is perpendicular to $2x + 2y - 8z + 5 = 0$, then λ is

A. 1

B. -4

C. -5

D. -3

Answer: A

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21. OPQR is a square with M and N as the middle points of the sides PQ and QR, respectively. The ratio of the areas of the square and the triangle OMN is

A. $4:1$

B. $2:1$

C. $8:3$

D. $4:3$

Answer: C

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22. The line passing through the extremity A of the major exis and extremity B of the minor axis of the ellipse $x^2 + 9y^2 = 9$ meets is auxiliary circle at the point M. Then the area of the triangle with vertices at A, M, and O (the origin) is 31/10 (b) 29/10 (c) 21/10 (d) 27/10

A. $\frac{31}{10}$

B. $\frac{29}{10}$

C. $\frac{21}{10}$

D. $\frac{27}{10}$

Answer: D

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23. If e_1 and e_2 are the eccentricities of a hyperbola $3x^2 - 2y^2 = 25$ and its conjugate, then

A. $e_{10^2+e_2^2=2}$

B. $e_1^2 + e_2^2 = 4$

C. $e_1 + e_2 = 4$

D. $e_1 + e_2 = \sqrt{2}$

Answer: B

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24. Let $f: R \to R$ be a function satisfying $f(x+y) = f(x) + 2y^3 + kxy$ for all $x, y \in R$. If f(1)=2 and f(2)= 8, then f(x) is equal to

A. $2x^2$

B. $6x - 4$

C. $x^2 + 3x - 2$

D. $-x^2 + 9x - 6$

Answer: A

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25. If the planes $\vec{r}.\left(2\hat{i} - \lambda\hat{j} + 3\hat{k}\right) = 0$ and $\vec{r}.\left(\lambda\hat{i} + 5\hat{j} - \hat{k}\right) = 5$ are perpendicular to each other then value of $\lambda^2 + \lambda$ is

A. 0

B. 2

C. 1

D. 3

Answer: A

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26. Solution of differential equation

$\frac{dy}{dx} = \sin(x+y) + \cos(x+y)$ is equal to

A. $\log\left(2 + \sec\frac{x+y}{2}\right) = x + C$

B. $\log(1 + \tan(x+y)) = x + C$

C. $\log\left(1 + \tan\frac{x+y}{2}\right) = y + C$

D. $\log\left(1 + \tan\ \frac{x+y}{2}\right) = x + C$

Answer: D

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27. Find the value of α so that $(\lim)_{x\ \vec{}\ 0}\frac{1}{x^2}(e^{\alpha x} - e^x - x) = \frac{3}{2}$

A. 1

B. 0

C. 4

D. 2

Answer: D

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28. An inverted conical flask is being filled with water at the rate of $3cm^3$ /sec. The height of the flask is 10cm and the radius of the base is 5cm. How fast is the water level rising when the level is 4cm?

A. $\frac{4}{3}\pi$ cm/sec

B. $\frac{3}{4\pi}$ cm/sec

C. $\frac{3\pi}{4}$ cm/sec

D. $\frac{4}{3\pi}$ cm/sec

Answer: B

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29. The equation of the curve whose slope at any point is equal to $y + 2x$ and which passes through the origin is

A. $y = 2(x - 1)$

B. $y = 2(e^x - x - 1)$

C. $y = 2(e^x - 1)$

D. $y = 2(e^x x - 1)$

Answer: B

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30. Let $f(x) = \begin{cases} x^p \sin\frac{1}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$ then $f(x)$ is continuous but not differentiable at $x = 0$, if

A. $p < 0$

B. $p = 0$

C. $0 < p \leq 1$

D. $p \geq 1$

Answer: C

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31. The solution $y(x)$ of the differential equation $\frac{d^2y}{dx^2} = \sin 3x + e^x + x^2$ when $y_1(0) = 1$ and $y(0) = 0$ is

A. $-\frac{\sin 3x}{9} + e^x + \frac{x^4}{12} + \frac{1}{3}x - 1$

B. $-\frac{\sin 3x}{9} + e^x + \frac{x^4}{12} + \frac{1}{3}x$

C. $-\frac{\cos 3x}{9} + e^x + \frac{x^4}{12} + \frac{1}{3}x + 1$

D. None of the above

Answer: A

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32. For which interval the given function $f(x) = 2x^3 - 9x^2 + 12x + 1$ is decreasing?

A. $(-2, \infty)$

B. $(-2, -1)$

C. $(-\infty, -1)$

D. $(-\infty, -2)$ or $(-1, \infty)$

Answer: D

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33. If θ is the angle between the vectors $4\left(\hat{i} - \hat{k}\right)$ and $\hat{i} + \hat{j} + \hat{k}$, then what is $(\sin\theta + \cos\theta)$ equal to ?

A. 0

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

C. 1

D. 2

Answer: C

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34. In a ΔABC, D, E, F are the mid -points of the sides BC, CA and AB respectively, the vector AD is equal to

A. $\overrightarrow{BE} + \overrightarrow{CF}$

B. $\overrightarrow{BE} - \overrightarrow{CF}$

C. $\overrightarrow{CF} - \overrightarrow{BE}$

D. $-\overrightarrow{BE} - \overrightarrow{CF}$

Answer: D

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35. The arithmetic mean of a set of observations is $\overline{X}$. If each observation is divided by α and then is increased by 10, then the mean of the new series is

A. $\frac{\overrightarrow{X}}{\alpha}$

B. $\frac{\overrightarrow{X}+10}{\alpha}$

C. $\frac{\overrightarrow{X}+10\alpha}{\alpha}$

D. $\alpha\overrightarrow{X}+10$

Answer: C

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36. If h is the altitude of a parallelopiped determined by the vectors a,b,c and the base is taken to be the parallelogram determined by a and b where $a=\hat{i}+\hat{j}+\hat{k}, b=2\hat{i}+4\hat{j}-\hat{k}$ and $c=\hat{i}+\hat{j}+3\hat{k}$, then the value of $19h^2$ is

A. 19

B. 16

C. 8

D. None of these

Answer: C

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37. The mean and variance of a Binomial distribution $\left(\overrightarrow{BD}\right)$ for 3 trials is 2.7, then the $\overrightarrow{BD}$ is given by

A. $(0.2+0.8)^5$

B. $(0.3+0.7)^5$

C. $(0.4+0.6)^5$

D. None of these

Answer: B

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38. Let $P(x) = \int \frac{dx}{e^x + 8e^{-x} + 4e^{-3x}}, Q(x) = \int \frac{dx}{e^{3x} + 8e^x + 4e^{-x}}$ and $R(x) =$. If $R(x) = \frac{1}{2}A\left(\frac{B + 2e^{-x}}{C}\right) + K$, then the value of (A, B,C) is

A. $\left(\tan^{-1}, 2, e^x\right)$

B. $\left(\tan^{-1}, e^x, 2\right)$

C. $\left(\tan^{-1}, \frac{1}{2}, \frac{1}{e^x}\right)$

D. $\left(\tan^{-1}, \frac{1}{e^x}, \frac{1}{2}\right)$

Answer: B

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39. $\int_0^1 \cot^{-1}\left(1 - x + x^2\right) dx$

A. log 2

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

C. $\frac{\pi}{2} + \log 2$

D. $-\log 2$

Answer: B

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40. The area of the region included between the curves $x^2 + y^2 = a^2$ and $\sqrt{|x|} + \sqrt{|y|} = \sqrt{a}(a > 0)$ is

A. $\left(\pi - \frac{2}{3}\right)a^2$ sq units

B. $\left(\frac{2}{3} - \pi\right)a^2$ sq units

C. $\frac{2}{3}\pi a^2$ sq units

D. $\left(\pi + \frac{2}{3}\right)a^2$ sq units

Answer: A

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41. $AandB$ are two independent events. The probability that both $AandB$ occur is 1/6 and the probability that neither of them occurs is 1/3. Find the probability of the occurrence of A.

A. 0 or 1

B. $\frac{1}{2}$ or $\frac{1}{3}$

C. $\frac{1}{2}$ or $\frac{1}{4}$

D. $\frac{1}{3}$ or $\frac{1}{4}$

Answer: B

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42. In a test, an examinee either guesses or copies or knows the answer to a multiple choice question with four choices. The probability that he makes a guess is $\frac{1}{3}$ and the probability that he copies the answer is 1/6. The probability that his answer is correct, given that he copied it, is 1/8.

Find the probability that he knew the answer to the question, given that be correctly answered it.

A. $\frac{27}{29}$

B. $\frac{26}{29}$

C. $\frac{25}{29}$

D. $\frac{24}{29}$

Answer: D

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43. If p: 4 is an even prime number, q: 6 is a divisor of 12 and r: the HCF of 4 and 6 is 2, then which of the following is correct ?

A. $(p \wedge q)$

B. $(p \vee q) \wedge \sim r$

C. $\sim(q \wedge r) \vee p$

D. $\sim p \vee (q \wedge r)$

Answer: D

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44. The maximum value of Z = 4x + 2y subject to the constraints $2x + 3y \leq 18, x + y \geq 10, x, y \geq 0$ is

A. 20

B. 36

C. 40

D. None of these

Answer: D

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45. The coordinates of the point at which minimum value of $Z = 7x - 8y$ subject to constraints $x + y - 20 \leq 0, y \geq 5, x \geq 0, y \geq 0$ is attained is

A. (20,0)

B. (15,5)

C. (0,5)

D. (0,20)

Answer: D

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