MATHS

BOOKS - BHARATI BHAWAN MATHS (HINGLISH)

Recent IIT questions

Exercise

1. Let (x_0, y_0) be the solution of the following equations

$(2x)^{In2} = (3y)^{In3}$ $3^{Inx} = 2^{Iny}$, then x_0 is

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

B. 1/3`

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

D. 6

Answer:

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2. Q. Let $P = \{\theta : \sin\theta - \cos\theta = \sqrt{2}\cos\theta\}$ and $Q = \{\theta : \sin\theta + \cos\theta = \sqrt{2}\sin\theta\}$ be two sets. then

A. $P \subset Q$ and $Q - P \neq \emptyset$

B. $Q! \subset P$

C. $P!SubQ$

D. $P = Q$

Answer:

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3. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + \hat{k} and \vec{c} = \hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of

$\vec{a}$ and $\vec{b}$, whose projection on $\vec{c}$ is $\frac{1}{\sqrt{3}}$ is given by $\hat{i} - 3\hat{j} + 3\hat{k}$ b. $-3\hat{i} - 3\hat{j} + 3\hat{k}$ c. $3\hat{i} - \hat{j} + 3\hat{k}$ d. $\hat{i} + 3\hat{j} - 3\hat{k}$

A. $\hat{i} - 3\hat{j} + 3\hat{k}$

B. $-3\hat{i} - 3\hat{j} + \hat{k}$

C. $3\hat{i} - \hat{j} + 3\hat{k}$

D. $\hat{i} - 3\hat{j} - 3\hat{k}$

Answer:

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4. Let α and β be the roots of equation $x^2 - 6x - 2 = 0$. If $a_n = \alpha^n - \beta^n$, for $n \geq 1$ then the value of $\frac{a_{10} - 2a_s}{2a_9}$ is equal to

A. 1

B. 2

C. 3

D. 4

Answer:

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5. A straight line L through the point (3,-2) is inclined at an angle 60° to the line $\sqrt{3}x + y = 1$ If L also intersects the x-axis then the equation of L is

A. $y + \sqrt{3}x + 2 - 3\sqrt{3} = 0$

B. $y - \sqrt{3}x + 2 + 3\sqrt{3} = 0$

C. $\sqrt{3}y - x + 3 + 2\sqrt{3} = 0$

D. $\sqrt{3}y + x - 3 + 2\sqrt{3} = 0$

Answer:

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6. Let the straight line $x = b$ divide the area enclosed by $y = (1 - x)^2, y = 0$ and $x = 0$ into two parts $R_1(0 \leq x \leq b)$ and $R_2(b \leq x \leq 1)$ such that $R_1 - R_2 = \frac{1}{4}$. Then b equals (A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{4}$

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

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

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

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

Answer:

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7. The vector(s) which is/are coplanar with vectors $\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}+2\hat{j}+\hat{k}$ are perpendicular to the vector $\hat{i}+\hat{j}+\hat{k}$ is are

A. $\hat{j}-\hat{k}$

B. $-\hat{i}+\hat{j}$

C. $\hat{i}-\hat{j}$

D. $jatj+\hat{k}$

Answer:

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8. Let the eccentricity of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ be reciprocal to that of the ellipse $x^2 + 4y^2 = 4$. If the hyperbola passes through a focus of the ellipse, then

A. the hyperbola has the equation $\frac{x^2}{3} - \frac{y^2}{2} = 1$

B. the focus of the hyperbola is $(2, 0)$

C. the eccentricity of the hyperbola is $(2, 0)$

D. the hyperbola has the equation

$$x^2 - 3y^2 = 3.$$

Answer:

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9. Let $MandN$ be two 3×3 non singular skew-symmetric matrices such that $MN = NM$. If P^T denote the transpose of P, then $M^2N^2\left(M^TN^{-1}\right)^T$ is equal to M^2 b. $-N^2$ c. $-M^2$ d. MN

A. M^2

B. $-N^2$

C. $-M^2$

D. MN

Answer:

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10. Let $f: R \to R$ be a function such that $f(x+y) = f(x) + f(y), Aax, y \in R.$ If f (x) is differentiable at x = 0, then

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

B. $f(x)$ is continous !V x in R`

C. $f(x)$ is constant !V x in R`

D. $f(x)$ is differentiable except at finitely many points

Answer:

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11. Let U_1 , and U_2, be two urns such that U_1, contains 3 white and 2 red balls, and U_2, contains only1 white ball. A fair coin is tossed. If head appears then 1 ball is drawn at random from U_1, and put into U_2, . However, if tail appears then 2 balls are drawn at random from U_1, and put into U_2. . Now 1 ball is drawn at random from U_2, .61 . The probability of the drawn ball from U_2, being white is

A. $\frac{13}{30}$

B. $\frac{23}{30}$

C. $\frac{19}{30}$

D. $\frac{11}{30}$

Answer:

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12. Given that the drawn ball from U2 is white, the probability that head appeared on the coin

A. $\frac{17}{23}$

B. $\frac{11}{23}$

C. $\frac{15}{23}$

D. $\frac{12}{23}$

Answer:

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13. If the point P(a, b, c), with reference to (E), lies on the plane 2x + y + z = 1, then the value of 7a + b + c is

A. 0

B. 12

C. 7

D. 6

Answer:

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14. Let ω be the solution of $x^3 - 1 = 0$ with $\text{Im}(\omega) > 0$. If a=2 with b and c satisfying $[abc]\begin{bmatrix} 1 & 9 & 7 \\ 2 & 8 & 7 \\ 7 & 3 & 7 \end{bmatrix} = [0, 0, 0]$, then the value of $\frac{3}{\omega^a} + \frac{1}{\omega^b} + \frac{1}{\omega^c}$ is equal to

A. -2

B. 2

C. 3

D. -3

Answer:

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15. Consider the parabola $y^2 = 8x$. Let Δ_1 be the area of the triangle formed by the end points of its latus rectum and the point $P\left(\frac{1}{2}, 2\right)$ on the parabola, and Δ_2 be the area of the triangle

formed by drawing tangents at P and at the end points of the latus rectum. Then $\frac{\Delta_1}{\Delta_2}$ is

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16. Let `f(theta)=sin(tan^(-1) ((sintheta)/(sqrt(cos2theta)))),w h e r e-pi/4

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17. Let $f:[1,\infty]$ be a differentiable function such that $f(1)=2$. If $\int_1^x f(t)dt = 3xf(x) - x^3$ for all $x \geq 1$, then the value of $f(2)$ is

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18. The positive integer value of $n > 3$ satisfying the equation

$$\frac{1}{\sin\left(\frac{\pi}{n}\right)} = \frac{1}{\sin\left(\frac{2\pi}{n}\right)} + \frac{1}{\sin\left(\frac{3\pi}{n}\right)} is$$

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19. The minimum value of the sum of real numbers

$a^{-5}, a^{-4}, 3a^{-3}, 1, a^{8}$ and a^{10} with $a > 0$ is

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20. If z is any complex number satisfying $|z-3-2i| \leq 2$, then the maximum value of $|2z-6+5i|$ is ___

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