



## MATHS

# BOOKS - BHARATI BHAWAN MATHS (HINGLISH)

# **Recent IIT questions**



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

 $\left(2x
ight)^{In2}=\left(3y
ight)^{In3}3^{Inx}=2^{Iny}$  , then  $x_{0}$  is

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

B. 1/3`

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

D. 6

#### Answer:

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  $Q - P 
eq \emptyset$ 

 $\mathsf{B}.\,Q!\subset P$ 

 $\mathsf{C}.\, P \, ! SubQ$ 

 $\mathsf{D}.\, P = Q$ 

#### **Answer:**

3. Let  

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

 $\overrightarrow{a}$  and  $\overrightarrow{b}$ , whose projection on  $\overrightarrow{c}$  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.  $\hat{i} - 3\hat{j} + 3\hat{k}$ 

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

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

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

#### Answer:

4. Let  $\alpha$  and  $\beta$  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  $\displaystyle \frac{a_{10}-2a_s}{2a_9}$  is equal to

A. 1

B. 2

C. 3

D. 4

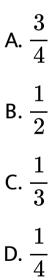


5. A straight line L through the point (3,-2) is inclined at an angle  $60^{\circ}$  to the line  $\sqrt{3}x + y = 1$ If L also intersects the x-axis then the equation of L is

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

6. Let the straight line x = b divide the area enclosed by  $y = (1 - x)^2$ , y = 0 and x = 0 into two parts  $R_1(0 \le x \le b)$  and  $R_2(b \le x \le 1)$ 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)  $\frac{1}{4}$ 



#### Answer:



. . . . . .

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

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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
$$rac{x^2}{3} - rac{y^2}{2} = 1$$

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: Watch Video Solution

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

 $B. - N^2$ 

 $\mathsf{C}.-M^2$ 

D. MN

#### **Answer:**

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10. Let  $f\!:\!R o R$  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



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 2balls 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:**



# **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.  $\frac{15}{23}$ 

#### 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  $\omega$  be the solution of  $x^3 - 1 = 0$  with  $\operatorname{Im}(\omega) > 0$ . If a=2 with b and c satisfying  $\begin{bmatrix} 1 & 9 & 7 \\ 2 & 8 & 7 \\ 7 & 3 & 7 \end{bmatrix} = [0, 0, 0]$ , 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

 $\mathsf{D.}-3$ 

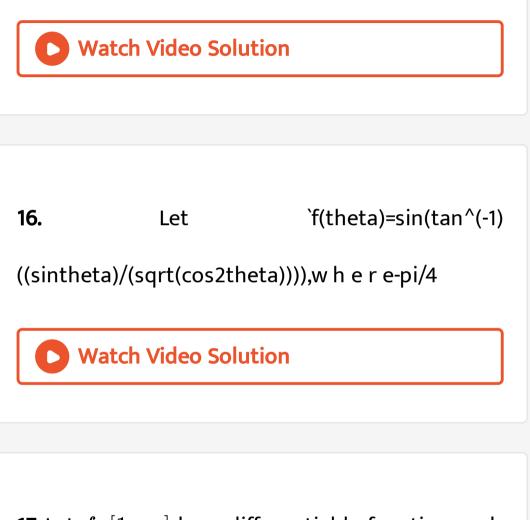
Answer:

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15. Consider the parabola  $y^2 = 8x$ . Let  $\Delta_1$  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  $\Delta_2$  be the area of the triangle

formed by drawing tangents at P and at the end

points of the latus rectum. Then  $rac{\Delta_1}{\Delta_2}$  is



17. Let  $f\colon [1,\infty]$  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



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

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





