



## MATHS

### BOOKS - NTA MOCK TESTS

### JEE MOCK TEST 20

#### Mathematics

1. If the integral

$$I = \int x^{\sin x} \left( \cos x \cdot \ln x + \frac{\sin x}{x} \right) dx, = (f(x))^{g(x)} + c (\forall x > 0)$$

then the range of  $y = g(x)$  is (where,  $c$  is an arbitrary constant)

A.  $[-1,1]$

B.  $[0,1]$

C. [0,1)

D. (-1,1)

**Answer: A**



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2. Let P and Q are two points in the xy plane on the curve

$y = x^{11} - 2x^7 + 7x^3 + 11x + 6$  such that

$\vec{OP} \cdot \hat{i} = 5, \vec{OQ} \cdot \hat{i} = -5$ , then the magnitude of  $\vec{OP} + \vec{OQ}$

is

A. 10

B. 12

C. 14

D. 8

**Answer: B**



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3. If the letters of the word REGULATIONS be arranged at random, find the probability that there will be exactly four letters between the  $R$  and the  $E$ .

A.  $\frac{6}{55}$

B.  $\frac{3}{55}$

C.  $\frac{5}{11}$

D.  $\frac{6}{11}$

**Answer: A**



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4. If the point of intersection of the plane  $4x - 5y + 2z - 6 = 0$  with the line through the origin and perpendicular to the plane  $x - 2y - 4z = 4$  is P, then the distance of the point P from (1, 2, 3) is

A.  $\sqrt{63}$  units

B. 8 units

C.  $\sqrt{65}$  units

D.  $\sqrt{72}$  units

**Answer: C**



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5. The mean and variance of seven observations are 8 and 16 respectively. If five of these are 2, 4, 10, 12 and 14, then find the

remaining two observations.

A. 5,7

B. 3,5

C. 6,8

D. 4,2

**Answer: C**



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6. Let  $\triangle ABC$  is an isosceles triangle with  $AB = AC$ . If  $B = (0, a)$ ,  $C = (2a, 0)$  and the equation of AB is  $3x - 4y + 4a = 0$ , then the equation of side AC is

A.  $y = 8x - 16a$

B.  $3y = 4x - 8a$

C.  $x = 2a$

D.  $y + 8x = 16a$

**Answer: C**



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7. Let  $A(0,3)$  and  $B(0,12)$  be two vertices of a  $\triangle ABC$  where  $C = (x, 0)$ . If the circumcircle of  $\triangle ABC$  touches the x-axis, then the value of  $\cos 2\theta$  is (where  $\theta$  is angle ACB)

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

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

C.  $\frac{8}{15}$

D.  $\frac{7}{25}$

**Answer: D**



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8. Consider three statements  $p$  : person 'A' passed in mathematics exam  $q$  : Person 'A' passed in physics exam  $r$  : Person 'A' passed in chemistry exam, Then the statement  $\sim((\sim(p \Rightarrow q) \Rightarrow r))$  is equivalent to

- A. Person A passed only in mathematics & physics & chemistry
- B. Person A failed only in mathematics & physics & chemistry
- C. Person A passed in all the three subjects mathematics & physics & chemistry

D. Person A passed in chemistry but failed in mathematics & physics.

**Answer: A**



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9. In equation  $(Z - 1)^n = Z^n = 1 (\forall n \in N)$  has solution, then n can be

A. 4

B. 12

C. 15

D. 21

**Answer: B**



10. The solution of the differential equation

$$\left(3x^2 \sin\left(\frac{1}{x}\right) + y\right)dx = x \cos\left(\frac{1}{x}\right)dx - xdy$$

is (where,  $c$  is an arbitrary constant)

A.  $\sin\left(\frac{1}{x}\right) = xy + c$

B.  $x^3 \sin\left(\frac{1}{x}\right) + xy = c$

C.  $x^3 \sin\left(\frac{1}{x}\right) = xy + c$

D.  $\sin\left(\frac{1}{x}\right) = x^3y + c$

**Answer: B**

11. The quadratic equation  $(1 - \sin \theta)x^2 + 2(1 - \sin \theta)x - 3 \sin \theta = 0$  has both roots complex for all  $\theta$  lying in the interval

A.  $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

B.  $\left(0, \frac{3\pi}{2}\right)$

C.  $\left(\frac{\pi}{6}, \frac{7\pi}{6}\right)$

D.  $\left(\frac{7\pi}{6}, \frac{11\pi}{6}\right)$

**Answer: D**



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12. The minimum value of the expression  $3x + 2y$  ( $\forall x, y > 0$ ), where  $xy^2 = 10$ , occurs when the value of  $y$  is equal to

A.  $\sqrt{10}$

B.  $\sqrt[3]{10}$

C.  $\sqrt[3]{30}$

D.  $\frac{1}{\sqrt{30}}$

**Answer: C**



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**13.** If in the expansion of  $(1 + x)^m(1 - x)^n$  the coefficient of  $x$  and  $x^2$  are 3 and  $(-6)$  respectively, then the value of  $n$  is-

A. 6

B. 9

C. 12

D. 24

**Answer: B**



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14. Number of words that can be formed with the letters of the word ALGEBRA so that all the vowels are separated (or no two vowels come together) is

A. 720

B. 2160

C. 1440

D. 1200

**Answer: A**



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15. If  $f(k - x) + f(x) = \sin x$ , then the value of integral

$$I = \int_0^k f(x) dx \text{ is equal to}$$

A.  $\cos k$

B.  $2 \cos^2\left(\frac{k}{2}\right)$

C.  $\sin^2\left(\frac{k}{2}\right)$

D.  $\sin k$

**Answer: C**



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16. If the difference between the number of subsets of the sets A and B is 120, then choose the incorrect option.

A. Maximum value of  $n(A \cap B) = 3$

B. Minimum value of  $n(A \cap B) = 0$

C. Maximum value of  $n(A \cup B) = 21$

D. Minimum value of  $n(A \cup B) = 7$

**Answer: C**



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**17.** For the function  $f(x) = \sin(\pi[x]) \times \cos^{-1}([x])$ , choose the correct option.

(where  $[.]$  represents the greatest integer function)

A. Domain of  $f(x)$  in  $[-1,1]$

B. Range of  $f(x)$  contains exactly two elements

C.  $f(x)$  is an identity function

D.  $f(x)$  is a constant function

**Answer: D**



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18. The value of  $\lim_{x \rightarrow 0} \frac{\sin x}{3} \left[ \frac{5}{x} \right]$  is equal to

[where  $[\cdot]$  represent the greatest integer function)

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

B. 0

C.  $\frac{5}{3}$

D. 1

**Answer: C**



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19. If  $y = \tan^{-1}\left(\frac{x}{1+6x^2}\right) + \tan^{-1}\left(\frac{2x-1}{2x+1}\right)$ , ( $\forall x > 0$ )  
then  $\frac{dy}{dx}$  is equal to

A.  $\frac{3}{1+9x^2}$

B.  $\frac{1}{1+6x^2}$

C.  $\frac{1}{1+6x^2} + \frac{1}{1+x^2}$

D.  $\frac{3}{1+6x^2}$

**Answer: A**

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20. If  $|3x-1|, 3, |x-3|$  are the first three terms of an arithmetic progression, then the sum of the first five terms can be



A. 5

B. 10

C. 20

D. 30

**Answer: A**



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$$21. \text{ If } f(x) = \begin{cases} px + q & : x \leq 2 \\ x^2 - 5x + 6 & : 2 < x < 3 \\ ax^2 + bx + 1 & : x \geq 3 \end{cases}$$

is differentiable everywhere, then  $|p| + |q| + \left| \frac{1}{a} \right| + \left| \frac{1}{b} \right|$  is equal to



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22. If the area bounded by  $y = \left| |x|^2 - 4|x| + 3 \right|$  and the x-axis from  $x = 1$  to  $x = 3$  is  $\frac{p}{q}$  (where, p & q are coprime) then the value of  $p + q$  is

A. 10

B. 9

C. 8

D. 7

**Answer: D**



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23. Let M be a square matrix of order 3 whose elements are real

number and  $adj(adjM) = \begin{bmatrix} 36 & 0 & -4 \\ 0 & 6 & 0 \\ 0 & 3 & 6 \end{bmatrix}$ , then the absolute

value of  $Tr(M)$  is [Here, adj P denotes adjoint matrix of P and  $Tr(P)$  denotes trace of matrix P i.e., sum of all principal diagonal elements of matrix P]



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24. If common tangents of  $x^2 + y^2 = r^2$  and  $\frac{x^2}{16} + \frac{y^2}{9} = 1$  forms a square, then the length of diagonal of the square is

- A. 9
- B. 10
- C. 12
- D. 1

**Answer: B**



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25. The angular depression of the top and the foot of the chimney seen from the top of a tower on the same base level as the chimney are  $\tan^{-1}\left(\frac{4}{3}\right)$  and  $\tan^{-1}\left(\frac{5}{2}\right)$  respectively if the height of the tower is 150m. then the distance between the top of the chimney and the tower is



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