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NUST-NET Math Past Papers 120 MCQs

1.

$$\left(cos\left(\frac{5\pi}{4}\right)+isin\left(\frac{5\pi}{4}\right)\right)^{12} =?$$

A. 0 **B.** -1

C. 1 **D.** $-1/2$

2.

The value of $(i^2+i^4+i^6+\cdots+i^{2n}) = ?$ **n is even.**

A. 0 **B.** -1

C. 1 **D.** $None\ of\ these$

3. $\left(\frac{1+i}{1-i}\right)^{4639} = ?$

A. 1 B. -1

C. i D. $-i$

4. Real part of $(2+i)^2$ is?

A. 3 B. 4

C. 5 D. 7

5. Multiplicative inverse of $(0,0)$ is ?

A. $(0,0)$ B. $(1,0)$

C. $(0,1)$ D. None of above

6. Which is Monoid under multiplication?

A. Set of Even Integers

B. Set of Odd Integers

C. Set of Negative Integers

D. Set of Prime numbers

7. $A = \{1, 2, 3, 4\}, B = \{a, b, c, d\}$
   $f = \{(a, 1), (b, 1), (c, 1), (d, 1)\}$ is which type of function from B to A.
   A. one-to-one
   B. one-to-many
   C. into
   D. onto

8. Let A and B be two finite sets having m and n elements respectively. If $m \leq n$, then total number of one-to-one functions from A to B is:
   A. m^n B. n^m
   C. $P(n, m)$ D. $C(n, m)$

9. Value of b if $\begin{vmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ a & a & 2b \end{vmatrix} = 0$?
   A. 0 B. 1
   C. a D. Any Real number

10.

If A and B are square matrices of order n, then adjoint of AB is:

A. (adj A) (adj B) **B. (adj B) (adj A)**

C. both A & B **D. Can't compute**

11. If order of a matrix A is 5×5 and $|A| = 3$, then $|adjA| = ?$

A. 9 **B. 27**

C. 81 **D. 243**

12. If $ax^2 + bx + c = 0$ has roots, α, β then the equation having roots of 2α & 2β is?

A. $ax^2 + 2bx - 4c = 0$ **B. $ax^2 + 2bx + 4c = 0$**

C. $ax^2 - 4bx + 2c = 0$ **D. $ax^2 - 2bx + 4c = 0$**

13. $$\frac{x}{(x+2)(x+3)} = \frac{A}{(x+2)} + \frac{B}{(x+3)}$$

What are A and B?

A. $A = 2$ & $B = 3$ **B. $A = -2$ & $B = 3$**

C. $A = 2$ & $B = -3$ **D. $A = -2$ & $B = -3$**

14.

$$\frac{x}{(x+3)(x-4)} = \frac{A}{x+3} + \frac{B}{x-4}$$

A) $A = \frac{3}{7}, B = \frac{4}{7}$

B) $A = -\frac{3}{7}, B = \frac{4}{7}$

C) $A = \frac{4}{7}, B = \frac{3}{7}$

D) $A = \frac{1}{7}, B = \frac{6}{7}$

Question 15

What is the 7^{th} term of the sequence $1, \frac{3}{2}, \frac{5}{4}, \frac{7}{8}, \ldots$?

Options: (A) $\frac{11}{32}$ (B) $\frac{13}{64}$ (C) $\frac{15}{64}$ (D) $\frac{13}{32}$

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Q.16

If the 8th term of an AP is $\frac{7}{3}$ and the 13th term is $\frac{11}{5}$, then the 15th term is:

A) $\frac{161}{75}$ B) $\frac{157}{75}$ C) $\frac{165}{75}$ D) $\frac{11}{5}$

Question 17

What is the sum of the infinite series $1, 0.2, 0.04, \ldots$?

Options: (A) 1.2 (B) 1.25 (C) 1.5 (D) 2.5

Question 18

Which term of the A.P. $5, 2, -1, \ldots$ is -85?

Options: (A) 30 (B) 31 (C) 32 (D) 33

Question 19

If the n^{th} term of a sequence is given by $a_n = 2n + 1$, then what is the sum of the first 11 terms?

Options: (A) 121 (B) 132 (C) 143 (D) 154

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Question 20

Sum of the first n terms of the series $\frac{1}{2} + \frac{3}{4} + \frac{7}{8} + \frac{15}{16} + \ldots$ is equal to:

Options: (A) $2^n - n - 1$ (B) $1 - 2^{-n}$ (C) $n + 2^{-n} - 1$ (D) $2^n + 1$

Question 21

What is the value of the summation $\sum_{i=0}^{4}(\cos \pi i)$?

Options: (A) -1 (B) 0 (C) 1 (D) 5

Question 22

What is the value of the summation $\sum_{i=52}^{100} 5$?

Options: (A) 240 (B) 245 (C) 250 (D) 490

Question 23

If a geometric series has a first term $a_1 = 1$ and a common ratio $r = 1.01$, then the series is:

Options: (A) Convergent (B) Divergent (C) Convergent with no sum (D) Sum is -200

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Question 24

Geometric Mean (G.M.) of 2 and 32 is:

Options: (A) 4 (B) 8 (C) 16 (D) 64

Question 25

What is the simplified value of the expression $\frac{(2n-1)!}{(2n+1)!}$?

Options: (A) $\frac{1}{2n(2n+1)}$ (B) $\frac{1}{(2n+1)(2n)}$ (C) $\frac{1}{(2n+1)(2n-1)}$ (D) $2n(2n+1)$

Question 26

How many ways can a team of 11 players be selected from a group of 16 players if one specific player must always be included in the team?

Options: (A) 3003 (B) 8008 (C) 1365 (D) 4368

Question 27

In how many ways can 6 different gifts be distributed among 6 different places, assuming each place receives exactly one gift?

Options: (A) 1 (B) 36 (C) 720 (D) 46656

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Q.28

In how many ways can 5 men, 5 women, and 5 children be seated at 3 **distinct round tables** if each table must accommodate exactly 5 people?

A) $({}^{15}C_5)({}^{10}C_5)(4!)^3$ B) $({}^{15}C_5)(5!)^3$ C) $({}^{15}C_5)({}^{10}C_5)(5!)^3$ D) $({}^{15}P_5)({}^{10}P_5)(4!)^3$

Question 29

What is the probability of obtaining at least one head in 4 tosses of a fair coin?

Options: (A) 1/16 (B) 4/16 (C) 15/16 (D) 1/4

Question 30

The letters of the word "MISSISSIPPI" are put into a box. What is the probability of selecting the letter 'M' first and then, without replacement, selecting the letter 'P'?

Options: (A) 2/121 (B) 2/110 (C) 1/110 (D) 1/121

Question 31

The probability that person A is alive is 5/7, and the probability that person B is alive is 7/9. Assuming their survival is independent, what is the probability that both of them are alive?

Options: (A) 5/9 (B) 12/16 (C) 35/63 (D) 2/7

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Question 32

$0! = 1$ **is true due to:**

A. Mathematical Induction **B.** Pascal's Triangle

C. Binomial Theorem **D.** Convention / Definition

Question 33

$n! > 2^n - 1$ **is true for:**

A. $n \geq 1$ **B.** $n \geq 2$ **C.** $n \geq 3$ **D.** $n \geq 4$

Question 34

Find the 5^{th} term in the expansion of:

$$\left(\frac{3}{2}x - \frac{1}{3x}\right)^{11}$$

Options: (A) $\frac{4455}{64}x^3$ (B) $\frac{4455}{32}x^3$ (C) $-\frac{4455}{64}x^3$ (D) $\frac{4455}{64}x^4$

Question 35

Find the middle term in the expansion of:

$$\left(\frac{x}{2}+\frac{2}{x^2}\right)^{12}$$

Options: (A) $924x^{-6}$ (B) $924x^{-12}$ (C) $792x^{-6}$ (D) $924x^{6}$

Question 36

Find the term independent of x in the expansion of:

$$\left(x-\frac{2}{x}\right)^{10}$$

Options: (A) -8064 (B) 8064 (C) -4032 (D) 4032

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Question 37

Evaluate:

$$\sin(-450^\circ) = ?$$

Options: (A) 0 (B) 1 (C) -1 (D) $\frac{1}{2}$

Question 38

If $\sin\theta = -\frac{5}{13}$ and θ is in the 4^{th} Quadrant, then $\cos\theta = ?$

Options: (A) $\frac{12}{13}$ (B) $-\frac{12}{13}$ (C) $\frac{5}{12}$ (D) $-\frac{5}{12}$

Question 39

Simplify the expression:

$$\frac{\csc^2\theta - 1}{\csc^2\theta} = ?$$

Options: (A) $\sin^2\theta$ (B) $\cos^2\theta$ (C) $\tan^2\theta$ (D) $\cot^2\theta$

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Question 40

Simplify the expression:

$$\frac{\cos(90^\circ + \theta)\sec(-\theta)\tan(180^\circ - \theta)}{\sec(360^\circ - \theta)\sin(180^\circ + \theta)\cot(90^\circ - \theta)}$$

Options: (A) -1 (B) 1 (C) $\tan\theta$ (D) $\cot\theta$

Question 41

If $\alpha, \beta,$ and γ are the angles of $\triangle ABC$, then:

$$\tan(\alpha + \beta) + \tan\gamma = ??$$

Options: (A) 0 (B) 1 (C) $2\tan\gamma$ (D) $\tan(\alpha + \beta + \gamma)$

Question 42

Simplify the expression:

$$\cos(\alpha + \beta)\cos(\alpha - \beta) = ?$$

Options: (a) $\sin^2\alpha - \sin^2\beta$ (b) $\cos^2\beta - \cos^2\alpha$ (c) $\cos^2\beta - \sin^2\alpha$ (d) $\sin^2\alpha - \cos^2\beta$

Question 43

Expand the triple angle identity:

$$\cos 3\alpha = ?$$

Options: (a) $3\cos^2\alpha - 4\cos\alpha$ (b) $4\cos^3\alpha + 3\cos\alpha$ (c) $4\cos^3\alpha - 3\cos\alpha$ (d) None of these

Question 44

Simplify the expression:

$$\cos^4\theta = ?$$

Options: (a) $\frac{1}{4}[3 + 4\cos 2\theta + 2\cos 4\theta]$ (b) $\frac{1}{8}[3 + 4\cos 2\theta + \cos 4\theta]$ (c) $\frac{1}{8}[3 - 4\cos 2\theta + \cos 4\theta]$ (d) $\frac{1}{4}[1 + 2\cos 2\theta + \cos 4\theta]$

Question 45

Simplify the expression:

$$\sin 5x + \sin 7x = ?$$

Options: (a) $-2\sin 6x\cos x$ (b) $2\cos 6x\sin x$ (c) $2\sin 6x\cos x$ (d) $-2\cos 6x\sin x$

Question 46

Evaluate the following expression:

$$\cos 20^\circ \cos 40^\circ \cos 80^\circ = ?$$

Options: (a) 1 (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{8}$

Question 47

What is the domain of $\sec x$?

Options: (a) $\mathbb{R}$ (b) $\mathbb{R} - \{n\pi, n \in \mathbb{Z}\}$ (c) $\mathbb{R} - \{(2n+1)\frac{\pi}{2}, n \in \mathbb{Z}\}$ (d) $[-1, 1]$

Question 48

What is the range of $\cot^{-1} x$?

Options: (a) $[0, \pi]$ (b) $(0, \pi)$ (c) $[-\frac{\pi}{2}, \frac{\pi}{2}]$ (d) $(-\frac{\pi}{2}, \frac{\pi}{2})$

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Question 49

The points that lie on the graph of $y = 2\sin x + \cos x$ are:

Options: (a) $(0°, 1), (90°, 2), (180°, -1), (270°, -2)$ (b) $(0°, 0), (90°, 1), (180°, 0), (270°, -1)$ (c) $(0°, 1), (90°, 1), (180°, 1), (270°, 1)$ (d) $(0°, -1), (90°, 2), (180°, 1), (270°, 0)$

Question 50

What is the period of $\tan \frac{x}{3}$?

Options: (a) π (b) 3π (c) $\frac{\pi}{3}$ (d) 6π

Question 51

If x is increasing, then $\sec x$ and $\csc x$ are decreasing in algebraic value. What is the quadrant?

Options: (a) 1^{st} Quadrant (b) 2^{nd} Quadrant (c) 3^{rd} Quadrant (d) 4^{th} Quadrant

Question 52

If the shadow of a 100 cm long tree is 100 cm, then what is the angle of elevation (θ)?

Options: (a) $30°$ (b) $45°$ (c) $60°$ (d) $90°$

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Question 53

A ladder, 5 meter long, standing on a horizontal floor, leans against a vertical wall. If the top of the ladder slides downwards at the rate of 10 cm/sec, then the rate at which the angle between the floor and the ladder is decreasing when the lower end of the ladder is 2 metres from the wall is:

(A) $1/10$ radian/sec \quad **(B)** $1/20$ radian/sec \quad **(C)** 20 radian/sec \quad **(D)** 10 radian/sec

Question 54

If $a = 12$, $b = 3$, and $c = 5$, then the area of the triangle is:

(A) 18 sq. units **(B)** 9 sq. units **(C)** 0 sq. units **(D)** Does not exist

Question 55

In a triangle ABC, given $a = 10$ cm, $\alpha = 30^\circ$, and $\beta = 45^\circ$, the length of side b is:

(A) $5\sqrt{2}$ cm **(B)** $10\sqrt{2}$ cm **(C)** 10 cm **(D)** 5 cm

Question 56

In $\triangle ABC$, if $b = 3$, $c = 5$, and the included angle $\alpha = 120^\circ$, then the length of side a is:

(A) 7 units **(B)** $\sqrt{19}$ units **(C)** $\sqrt{34}$ units **(D)** 8 units

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Question 57

In $\triangle ABC$, given $b = 3$, $c = 5$, and the angle $\alpha = 120^\circ$, the area of the triangle is:

(A) $\frac{15}{2}$ sq. units **(B)** $\frac{15\sqrt{3}}{4}$ sq. units **(C)** 15 sq. units **(D)** $\frac{15\sqrt{3}}{2}$ sq. units

Question 58

In $\triangle ABC$, if Δ represents the area and s represents the semi-perimeter, which of the following expressions correctly represents the in-radius (r) of the triangle?

(A) $r = \frac{s}{\Delta}$ **(B)** $r = \frac{\Delta}{s}$ **(C)** $r = \frac{\Delta}{s-a}$ **(D)** $r = \frac{s-a}{\Delta}$

Question 59

The value of $\sin\left(\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)\right)$ is:

(A) $\frac{\sqrt{3}}{2}$ **(B)** $\frac{1}{2}$ **(C)** 0 **(D)** 1

Question 60

The value of $\tan\left(\sin^{-1} x + \cos^{-1} x\right)$ **for any** $x \in [-1, 1]$ **is:**

(A) 0 **(B)** 1 **(C)** $\frac{\pi}{2}$ **(D)** Not defined

Question 61

The value of $2\tan^{-1}\left(\frac{2}{3}\right)$ **is equal to:**

(A) $\sin^{-1}\left(\frac{5}{13}\right)$ **(B)** $\sin^{-1}\left(\frac{12}{13}\right)$ **(C)** $\cos^{-1}\left(\frac{12}{13}\right)$ **(D)** $\sin^{-1}\left(\frac{2}{3}\right)$

Question 62

In $\triangle ABC$**, given** s **is the semi-perimeter and** a, b, c **are the sides, the formula for** $\tan\frac{\alpha}{2}$ **is:**

(A) $\sqrt{\frac{(s-b)(s-c)}{bc}}$ **(B)** $\sqrt{\frac{(s-a)(s-b)}{s(s-c)}}$ **(C)** $\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$ **(D)** $\sqrt{\frac{s(s-a)}{(s-b)(s-c)}}$

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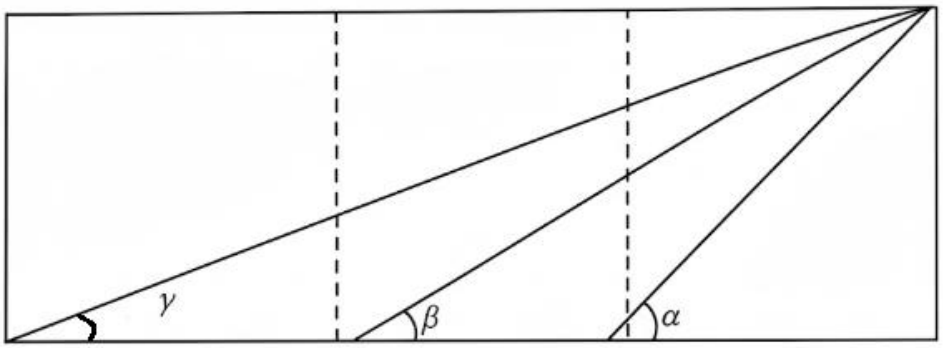
Question 63

In the figure below, three identical squares are placed side by side. If $\alpha, \beta, \text{ and } \gamma$ are the angles formed by the diagonals as shown, then the value of $\alpha + \beta + \gamma$ is:

(A) $\pi/4$ **(B)** $\pi/3$ **(C)** $\pi/2$ **(D)** π



Question 64

Which of the following limit identities is true?

(A) $\lim_{p\to 0}(1+p)^{1/p} = e$ **(B)** $\lim_{p\to \infty}(1+p)^{1/p} = e$ **(C)** $\lim_{p\to 0}(1+\frac{1}{p})^{p} = e$ **(D)** $\lim_{p\to \infty}(1+\frac{1}{p})^{p} = 1$

Question 65

If $f(x) = 3x - 1$ and $g(x) = \frac{1}{x}$, then the composite function $(g \circ f)(x)$ is:

(A) $\frac{3}{x} - 1$ **(B)** $\frac{1}{3x-1}$ **(C)** $3x$ **(D)** $\frac{x}{3-x}$

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Question 66

Given the function $f(x) = \frac{2x+1}{x-1}$ for $x > 1$, the value of $f^{-1}(x)$ is:

(A) $\frac{x+1}{x-2}$ **(B)** $\frac{x-1}{x+2}$ **(C)** $\frac{2x-1}{x+1}$ **(D)** $\frac{x-2}{x+1}$

Question 67

Which of the following is a one-one (injective) function?

(A) $f(x) = x^2 + 1$ **(B)** $f(x) = |x|$ **(C)** $f(x) = 2x + 6$ **(D)** $f(x) = \cos x$

Question 68

Consider the following mathematical expressions. Which of them represent valid functions of x?

$f(x) = \sqrt{x}\ g(x) = x\ h(x) = x^2 + 1$

(A) f and g only **(B)** f and h only **(C)** g and h only **(D)** All are functions

Question 69

The domain of the function $f(x) = \sqrt{4 - x^2}$ is:

(A) $(-2, 2)$ **(B)** $[-2, 2]$ **(C)** $\{x \in \mathbb{R} : |x| \geq 2\}$ **(D)** $[0, 2]$

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Question 70

Evaluate the limit: $\lim_{x \to 2} \frac{x^3 - 8}{x^2 + x - 6}$

(A) 0 **(B)** $12/5$ **(C)** 2 **(D)** Undefined

Question 71

Consider the piecewise function $f(x)$ defined below:

$$f(x) = \begin{cases} x - 1 & \text{if } x < 3 \\ 2x + 1 & \text{if } 3 \leq x < 5 \\ x^2 - 14 & \text{if } x \geq 5 \end{cases}$$

Which of the following statements regarding the continuity of $f(x)$ is true?

- **A)** $f(x)$ is continuous for all real numbers x.
- **B)** $f(x)$ is discontinuous only at $x = 3$.
- **C)** $f(x)$ is discontinuous only at $x = 5$.
- **D)** $f(x)$ is discontinuous at both $x = 3$ and $x = 5$.

Q.72

If the volume of a sphere increases at a constant rate, then the rate at which the radius of the sphere increases is:

- **A)** Proportional to the radius (r).
- **B)** Inversely proportional to the radius $(1/r)$.
- **C)** Inversely proportional to the square of the radius $(1/r^2)$.
- **D)** Constant.

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Question 73

Consider the quadratic function $f(x) = ax^2 + bx + c$. Given the following conditions:

- $f(2) = 26$
- $f'(2) = 23$
- $f''(2) = 14$

Which set of values correctly identifies the coefficients a, b, and c?

- **A)** $a = 14, b = 23, c = 26$
- **B)** $a = 7, b = -5, c = 8$
- **C)** $a = 7, b = 5, c = -8$
- **D)** $a = 14, b = -5, c = 10$

Question 74

If the derivative of a function is **strictly positive** for all x in a given interval, then the function is strictly _____ for that interval.

- **a)** Constant
- **b)** Increasing
- **c)** Decreasing
- **d)** None of these

Question 75

Which of the following functions is an even function?

- **a)** $f(x) = x^4 + x$
- **b)** $f(x) = [x]$ (Greatest Integer Function)
- **c)** $f(x) = |x| + \cos x$
- **d)** $f(x) = \sin x$

Question 76

The function $y = x + \cos x$ is:

- **a)** Always increasing
- **b)** Always decreasing
- **c)** Increasing for a specific range of x
- **d)** None of the above

Question 77

If $f(x) = e^{-3x}$, then what is the value of the third derivative, $f'''(x)$?

- **a)** $-3e^{-3x}$
- **b)** $9e^{-3x}$
- **c)** $-27e^{-3x}$
- **d)** $27e^{-3x}$

Question 78

If $f'(a) = 0$ and $f''(a) > 0$, then $f(x)$ has a relative minimum at:

- **a)** $x = a$
- **b)** $x = -a$
- **c)** $x = \frac{1}{a}$
- **d)** $x = -\frac{1}{a}$

Question 79

If $y = \sin\left(\frac{1}{x}\right)$, then the value of $f'\left(\frac{6}{5\pi}\right)$ is:

- a) $\frac{25\pi^2\sqrt{3}}{72}$
- b) $-\frac{25\pi^2\sqrt{3}}{72}$
- c) $\frac{25\pi^2}{72}$
- d) $-\frac{25\pi^2}{72}$

Question 80

Evaluate the definite integral:

$$\int_{-1}^{1} x\sqrt{x^2-1}\,dx$$

- a) $\frac{2}{3}$
- b) $-\frac{2}{3}$
- c) 1
- d) 0

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Question 81

The integral $\int \tan^2 x \, dx$ is equal to:

- **a)** $\sec^2 x + C$
- **b)** $\tan x - x + C$
- **c)** $\frac{\tan^3 x}{3} + C$
- **d)** $\tan x + x + C$

Question 82

If x changes from 1 to 0.9 and $f(x) = 2 + x^2$, then the change in $f(x)$ is:

- **a)** 0.19
- **b)** -0.19
- **c)** 0.2
- **d)** -0.2

Question 83

The integral $\int \sqrt{1 + \sin x} \, dx$ is equal to:

- **a)** $2(\sin \frac{x}{2} - \cos \frac{x}{2}) + C$
- **b)** $2(\cos \frac{x}{2} - \sin \frac{x}{2}) + C$
- **c)** $\frac{2}{3}(1 + \sin x)^{3/2} + C$
- **d)** $\sqrt{1 - \sin x} + C$

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Question 84

Find the area of the region bounded by the parabola $y^2 = 4x$ and the line $y = 2x$.

- **A)** $\frac{1}{6}$ sq. units
- **B)** $\frac{1}{3}$ sq. units
- **C)** $\frac{2}{3}$ sq. units
- **D)** $\frac{4}{3}$ sq. units

Question 85

Find the order and degree of the following differential equation:

$$\left(\frac{d^2y}{dx^2}\right) + 3\frac{dy}{dx} + 4 = 0$$

- **A)** Order: 1, Degree: 2
- **B)** Order: 2, Degree: 1
- **C)** Order: 2, Degree: 2
- **D)** Order: 1, Degree: 1

Question 86

The integral $\int (x \ln x + x(\ln x)^2)\, dx$ is equal to:

- A) $\frac{x^2}{2}(\ln x)^2 + C$
- B) $x^2 \ln x - \frac{x^2}{2} + C$
- C) $\frac{x^2}{2} \ln x + C$
- D) $\frac{x^2}{2}[(\ln x)^2 - \ln x] + C$

Question 87

The angle from a line having a slope of 1 to a line with a slope of -1 is:

- a) $\frac{\pi}{4}$
- b) $\frac{\pi}{2}$
- c) $\frac{3\pi}{4}$
- d) π

Question 88

The line $x = y$ has inclination (angle):

- a) $\frac{\pi}{6}$
- b) $\frac{\pi}{4}$
- c) $\frac{\pi}{3}$
- d) $\frac{\pi}{2}$

Question 89

Find the equation of the tangent line having an x-intercept of 1 and a y-intercept of 2.

- a) $2x + y - 2 = 0$
- b) $x + 2y - 2 = 0$
- c) $2x - y + 2 = 0$
- d) $x - 2y + 2 = 0$

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Question 90

If the axes are rotated through an angle of 45°, then the transformation equation for x in terms of the new coordinates (X, Y) is:

- **a)** $x = \frac{1}{\sqrt{2}}(X - Y)$
- **b)** $x = \frac{1}{\sqrt{2}}(X + Y)$
- **c)** $x = \frac{1}{2}(X - Y)$
- **d)** $x = \frac{1}{2}(X + Y)$

Question 91

The equation of a line which is perpendicular ($\perp$) to a line with slope -6 and has a y-intercept of $\frac{4}{3}$ is:

- **a)** $x - 6y + 8 = 0$
- **b)** $6x + y - 8 = 0$
- **c)** $x + 6y - 8 = 0$
- **d)** $x - 6y - 8 = 0$

Question 92

The distance between the lines $2x - 5y + 13 = 0$ and $2x - 5y + 6 = 0$ is:

- **A)** $\frac{7}{\sqrt{29}}$ units
- **B)** $\frac{19}{\sqrt{29}}$ units
- **C)** $\frac{7}{29}$ units
- **D)** $\sqrt{29}$ units

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Question 93

The distance of point $P(6, -1)$ from the line $6x - 4y + 9 = 0$ is:

- **A)** $\frac{49}{\sqrt{52}}$ units
- **B)** $\frac{41}{\sqrt{52}}$ units
- **C)** $\frac{49}{52}$ units
- **D)** $\frac{\sqrt{52}}{49}$ units

Question 94

The pair of lines representing the joint equation $20x^2 + 17xy - 24y^2 = 0$ is:

- **A)** $(4x - 3y)(5x + 8y) = 0$
- **B)** $(4x + 3y)(5x - 8y) = 0$
- **C)** $(2x - 3y)(10x + 8y) = 0$
- **D)** $(5x - 3y)(4x + 8y) = 0$

Question 95

The inequality $\frac{2-3x}{6} < 1$ is true for what values of x?

- A) $x < -\frac{4}{3}$
- B) $x > -\frac{4}{3}$
- C) $x < \frac{4}{3}$
- D) $x > \frac{4}{3}$

Question 96

If the cone is cut by a plane perpendicular to the axis of the cone, then the section is:

- **A)** Parabola
- **B)** Ellipse
- **C)** Circle
- **D)** Hyperbola

Question 97

The radius of the circle $x^2 + y^2 - 10x + 5 = 0$ is:

- **A)** $2\sqrt{5}$ units
- **B)** $4\sqrt{5}$ units
- **C)** 5 units
- **D)** $\sqrt{5}$ units

Question 98

The equation of the parabola in standard form, if the coordinates of the focus are $F(2, \frac{15}{4})$ and the equation of the directrix is $4y - 9 = 0$, is:

- **A)** $(x-2)^2 = 6(y-3)$
- **B)** $(x-2)^2 = 3(y-3)$
- **C)** $(x-3)^2 = 6(y-2)$
- **D)** $(y-3)^2 = 6(x-2)$

Question 99

The length of the semi-major axis of the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is:

- **A)** 2 units
- **B)** 3 units
- **C)** 4 units
- **D)** 9 units

Question 100

The coordinates of the co-vertices of the ellipse $\frac{(x-1)^2}{4} + \frac{(y+1)^2}{9} = 1$ are:

- **A)** $(1, -1)$ and $(3, -1)$
- **B)** $(-1, -1)$ and $(3, -1)$
- **C)** $(1, 2)$ and $(1, -4)$
- **D)** $(1, 1)$ and $(1, -3)$

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Question 101

The eccentricity of the hyperbola $\frac{y^2}{16} - \frac{x^2}{49} = 1$ is:

- A) $\frac{\sqrt{65}}{7}$
- B) $\frac{\sqrt{65}}{4}$
- C) $\frac{\sqrt{33}}{4}$
- D) $\frac{65}{16}$

Question 102

Which of the following properties of vector addition is true?

- a) $\underline{u} + \underline{v} = \underline{v} + \underline{u}$
- b) $(\underline{u} + \underline{v}) + \underline{w} = (\underline{u} + \underline{w}) - \underline{v}$
- c) $\underline{u} - \underline{v} = \underline{v} - \underline{u}$
- d) $\underline{u} + \underline{v} = -(\underline{v} + \underline{u})$

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Question 103

The unit vector in the direction of $\underline{v} = 2\underline{i} + 6\underline{j} + 4\underline{k}$ is:

- **a)** $\frac{1}{\sqrt{56}}(2\underline{i} + 6\underline{j} + 4\underline{k})$
- **b)** $\frac{1}{56}(2\underline{i} + 6\underline{j} + 4\underline{k})$
- **c)** $\frac{1}{\sqrt{12}}(2\underline{i} + 6\underline{j} + 4\underline{k})$
- **d)** $(2\underline{i} + 6\underline{j} + 4\underline{k})$

Question 104

Find the value of k if the magnitude of the vector $k\underline{i} + (k+1)\underline{j} + 2\underline{k}$ is equal to 3.

- **a)** $k = 1$ or $k = -2$
- **b)** $k = 2$ or $k = -1$
- **c)** $k = 1$ or $k = 2$

Question 105

Find the constant α (indicated as the first coefficient in vector $\underline{w}$) if the vectors $\underline{v} = \underline{i} - 3\underline{j} + 4\underline{k}$ and $\underline{w} = \alpha\underline{i} + 9\underline{j} - 12\underline{k}$ are parallel.

- **a)** $\alpha = 3$
- **b)** $\alpha = -3$
- **c)** $\alpha = 1$
- **d)** $\alpha = -1$

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Question 106

The projection of vector $\underline{a}$ along $\underline{b}$ if $\underline{a} = 3\underline{i} + \underline{j} - \underline{k}$ and $\underline{b} = -2\underline{i} - \underline{j} + \underline{k}$ is:

- **A)** $-\frac{8}{\sqrt{6}}$ units
- **B)** $-\frac{8}{6}$ units
- **C)** $\frac{8}{\sqrt{11}}$ units
- **D)** $-\frac{8}{\sqrt{14}}$ units

Question 107

Find the volume of the parallelepiped if the vectors $v, u,$ and w are given as:

- $v = \underline{i} - 2\underline{j} + 3\underline{k}$
- $u = \underline{i} + 2\underline{j} - \underline{k}$
- $w = \underline{i} - 7\underline{j} - 4\underline{k}$

Options:

- **A)** 22 cubic units
- **B)** 44 cubic units
- **C)** 11 cubic units
- **D)** 33 cubic units

Question 108

What is the volume of the tetrahedron whose vertices are $A(2,1,8)$, $B(3,2,9)$, $C(2,1,4)$, and $D(3,3,0)$?

- **A)** 2 cubic units
- **B)** $\frac{2}{3}$ cubic units
- **C)** 4 cubic units
- **D)** 6 cubic units

Question 109

The value of $2\underline{i} \times 2\underline{j} \cdot \underline{k}$ is:

- **A)** 0
- **B)** 2
- **C)** 4
- **D)** $4\underline{k}$

Question 110

Find the torque at point $P(-2, 4, -6)$ when force F is applied from point $A(1, 2, -3)$ to point $B(3, -4, 2)$.

- **A)** $8\underline{i} + 9\underline{j} - 14\underline{k}$
- **B)** $8\underline{i} - 9\underline{j} - 14\underline{k}$
- **C)** $3\underline{i} - 2\underline{j} + 3\underline{k}$
- **D)** $2\underline{i} - 6\underline{j} + 5\underline{k}$

Question 111

If $a : b = 2 : 3$, then the value of $\frac{2a+3b}{2a-3b}$ is:

- **A)** $\frac{13}{5}$
- **B)** $-\frac{13}{5}$
- **C)** $\frac{5}{13}$
- **D)** $-\frac{5}{13}$

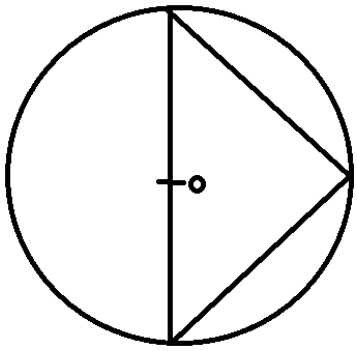
Question 112

A solid cylinder has a height of $12\ \text{cm}$ and a base radius of $3\ \text{cm}$. What is the maximum possible distance between two points A and B that lie on the surface of the cylinder?

- **A)** $\frac{62}{5}\ \text{cm}$
- **B)** $6\sqrt{5}\ \text{cm}$
- **C)** $\frac{27}{2}\ \text{cm}$
- **D)** $15\ \text{cm}$

Question 113

Based on the diagram below, find the Area and the Perimeter of the triangle inscribed in the circle with center O and radius $r = 2\ \text{cm}$.



- **A)** Area: $4\ \text{cm}^2$; Perimeter: $4 + 4\sqrt{2}\ \text{cm}$
- **B)** Area: $2\ \text{cm}^2$; Perimeter: $4 + 2\sqrt{2}\ \text{cm}$
- **C)** Area: $4\ \text{cm}^2$; Perimeter: $12\ \text{cm}$
- **D)** Area: $8\ \text{cm}^2$; Perimeter: $8 + 4\sqrt{2}\ \text{cm}$

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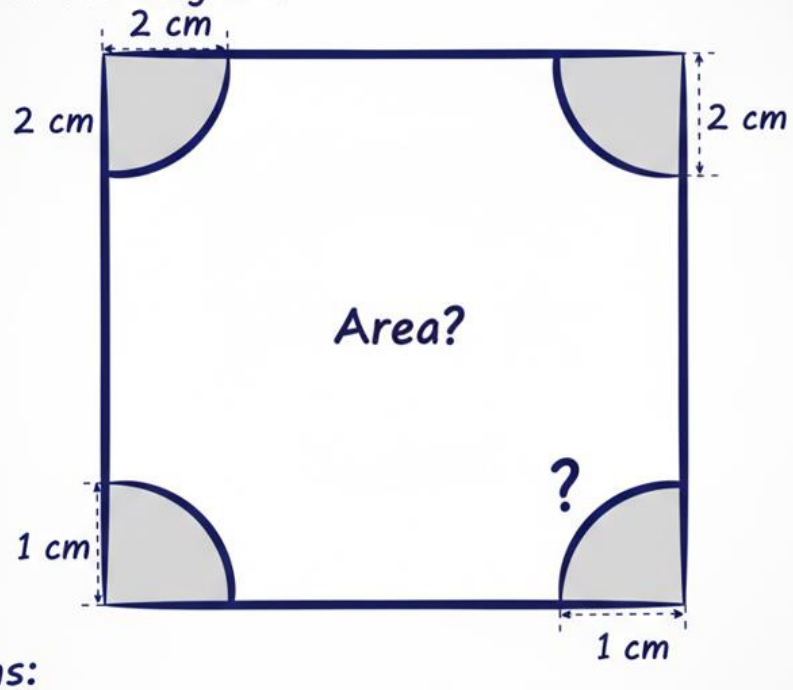
Q.114

The total area of a square was 64 cm^2
Find the remining area after remoing the corner edges as shown in the diagram.



Options:

A) $(64 - 5\pi)\ cm^2$
B) $(64 - 5/\frac{2}{2})\ cm^2$
C) $(64 - 10\pi)\ cm^2$
D) $(64 - \pi)$

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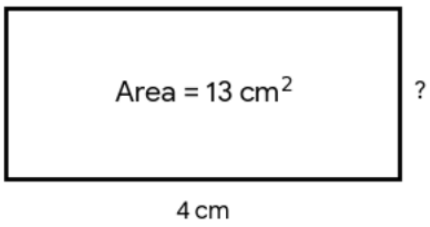
Question 115

Given a rectangle with a length of $4\ \text{cm}$ and an area of $13\ \text{cm}^2$, what is the width?

Options:

- **A)** $\frac{4}{13}\ \text{cm}$
- **B)** $\frac{13}{4}\ \text{cm}$
- **C)** $\frac{9}{4}\ \text{cm}$
- **D)** $\frac{13}{2}\ \text{cm}$



Question 116

A line passes through the midpoint of the segment AB, where $A(2, 2)$ and $B(6, 4)$. If this line is parallel to the line $x + y - 5 = 0$, what is its equation?

Options:

- **A)** $x + y - 7 = 0$
- **B)** $x + y - 5 = 0$
- **C)** $x - y - 1 = 0$
- **D)** $x + y + 7 = 0$

Question 117

The value of $\underline{i} \times (\underline{j} \times \underline{k})$ is:

- A) $\underline{i}$
- B) $\underline{j}$
- C) $\underline{k}$
- D) $\underline{0}$

Question 118

Find the angle between the vectors $a = \underline{i} + \underline{j}$ and $b = \underline{j} + \underline{k}$.

Options:

- A) $\frac{\pi}{6}$ rad
- B) $\frac{\pi}{4}$ rad
- C) $\frac{\pi}{3}$ rad
- D) $\frac{\pi}{2}$ rad

Question 119

Which of the following is a trinomial?

- A) $x^3 + x^6$
- B) $x^3 + 1$
- C) $x^2 + 5x + 6$
- D) $x^3 + 2x^2 + 4x - 7$

Question 120

Find the area of the shaded region of the circle shown in the diagram.

Options:

- A) $\left(\frac{4\pi}{3} - \sqrt{3}\right)\ \mathrm{m}^2$
- B) $\left(\frac{2\pi}{3} - \sqrt{3}\right)\ \mathrm{m}^2$
- C) $\left(\frac{4\pi}{3} - 2\sqrt{3}\right)\ \mathrm{m}^2$
- D) $\left(4\pi - \sqrt{3}\right)\ \mathrm{m}^2$