MATHEMATICS - CET 2025 - VERSION CODE – D1
KEYS

1. If A and B are two non-mutually exclusive events such that $P(A|B) = P(B|A)$, then
(1) $A \subset B$ but $A \neq B$ (2) $A = B$ (3) $A \cap B = \phi$ (4) $P(A) = P(B)$
Ans (4)
Given $P(A|B) = P(B|A)$
$\Rightarrow \frac{P(A \cap B)}{P(B)} = \frac{P(B \cap A)}{P(A)}$
$\Rightarrow P(A) = P(B)$

2. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?
(1) $P(A \mid B) = \frac{P(B)}{P(A)}$ (2) $P(A|B) < P(A)$ (3) $P(A|B) \geq P(A)$ (4) $P(A) = P(B)$
Ans (3)
Given $A \subset B$
$\Rightarrow A \cap B = A$
We have $P(B) \leq 1 \Rightarrow \frac{1}{P(B)} \geq 1$
$\Rightarrow \frac{P(A \cap B)}{P(B)} \geq P(A \cap B)$
$\Rightarrow P(A|B) \geq P(A) \quad [\because A \cap B = A]$

3. Meera visits only one of the two temples A and B in her locality. Probability that she visits temple A is $\frac{2}{5}$. If she visits temple A, $\frac{1}{3}$ is the probability that she meets her friend, whereas it is $\frac{2}{7}$ if she visits temple B. Meera met her friend at one of the two temples. The probability that she met her at temple B is
(1) $\frac{7}{16}$ (2) $\frac{5}{16}$ (3) $\frac{3}{16}$ (4) $\frac{9}{16}$
Ans (4)
Given $P(A) = \frac{2}{5}$
$\Rightarrow P(B) = \frac{3}{5}$
Let M be the event that Meera meets her friend.
Now $P\left(\frac{M}{A}\right) = \frac{1}{3}, P\left(\frac{M}{B}\right) = \frac{2}{7}$
We have to find $P\left(\frac{B}{M}\right)$

$$P\left(\frac{B}{M}\right) = \frac{P(B)P\left(\frac{M}{B}\right)}{P(A)P\left(\frac{M}{A}\right) + P(B)P\left(\frac{M}{B}\right)}$$

$$= \frac{\frac{3}{5}\cdot\frac{2}{7}}{\frac{2}{5}\cdot\frac{1}{3}+\frac{3}{5}\cdot\frac{2}{7}} = \frac{9}{16}$$

4. If Z_1 and Z_2 are two non-zero complex numbers, then which of the following is not true?
(1) $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$ (2) $|Z_1 Z_2| = |Z_1| \cdot |Z_2|$ (3) $\overline{Z_1 Z_2} = \overline{Z_1} \cdot \overline{Z_2}$ (4) $|Z_1 + Z_2| \geq |Z_1| + |Z_2|$
Ans (4)
It is the property that $|Z_1 + Z_2| \leq |Z_1| + |Z_2|$

5. Consider the following statements:
Statement (I): The set of all solutions of the linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ are $x < 3$ and $x \geq 2$ respectively.
Statement (II): The common set of solutions of linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ is $(2, 3)$
Which of the following is true?
(1) Statement (I) is true but statement (II) is false (2) Statement (I) is false but statement (II) is true
(3) Both the statements are true (4) Both the statements are false
Ans (1)
If we solve the equations we get $x < 3$ and $x \geq 2$
$\Rightarrow x \in [2, 3)$
But given $(2, 3)$ in statement II which is false.

6. The number of four digit even number that can be formed using the digits 0, 1, 2 and 3 without repetition is
(1) 6 (2) 10 (3) 4 (4) 12
Ans (2)
0 1 2 3

			0	3!	= 6
			2	3!	= 6
0			2	2!	= 2

Difference $6 - 2 = 4$

Total $6 + 4 = 10$

7. The number of diagonals that can be drawn in an octagon is
(1) 15 (2) 20 (3) 28 (4) 30
Ans (2)
$${}^{8}C_2 - 8 = \frac{8!}{6!\ 2!} - 8 = \frac{8\times 7}{2} - 8 = 20$$

8. If the number of terms in the binomial expansion of $(2x + 3)^{3n}$ is 22, then the value of n is
(1) 8 (2) 6 (3) 7 (4) 9
Ans (3)
$3n + 1 = 22$
$3n = 21 \Rightarrow n = 7$

9. If 4th, 10th and 16th terms of a G.P. are x, y and z respectively, then

(1) $z=\sqrt{xy}$ (2) $y=\sqrt{xz}$ (3) $x=\sqrt{yz}$ (4) $y=\frac{x+z}{2}$

Ans (2)

$T_4 = ar^3 = x$ …(1)

$T_{10} = ar^9 = y$ …(2)

$T_{16} = ar^{15} = z$ …(3)

$\frac{(2)}{(1)} \Rightarrow \frac{y}{x}=r^6$ $\frac{(3)}{(2)} \Rightarrow \frac{z}{y}=r^6$

$\frac{y}{x}=\frac{z}{y} \Rightarrow y^2 = xz \quad \Rightarrow y=\sqrt{xz}$

10. If A is a square matrix such that $A^2 = A$, then $(I - A)^3$ is

(1) I – A (2) A – I (3) I + A (4) – I –A

Ans (1)

$(I - A)^3 = I^3 - 3IA\,(I - A) - A^3$

$= I - 3A\,(I - A) - A^3$

$= I - 3A + 3A^2 - A^3$

$= I - 3A + 3A - A^3$

$= I - A^2 - A$

$= I - A^2$

$= I - A$

11. If A and B are two matrices such that AB is an identity matrix and the order of matrix B is 3×4, then the order of matrix A is

(1) 3×4 (2) 3×3 (3) 4×3 (4) 4×4

Ans (3)

AB = I

$A = 4 \times 3$

$B = 3 \times 4$

12. Which of the following statements is not correct?

(1) A row matrix has only one row

(2) A diagonal matrix has all diagonal elements equal to zero

(3) A symmetric matrix A is a square matrix satisfying $A' = A$

(4) A skew symmetric matrix has all diagonal elements equal to zero

Ans (2)

13. If a matrix $A=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$ satisfies $A^6 = kA'$, then the value of k is

(1) 32 (2) 1 (3) $\frac{1}{32}$ (4) 6

Ans (1)

$A^2=\begin{bmatrix}2 & 2\\ 2 & 2\end{bmatrix}$

$$A^2 = 2A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$$

$$= 2\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} = 2A$$

$$A^4 = 4\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} = 8\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} = 8A$$

$$A^6 = 16A^2 = 16\begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix} = 32\ A$$

$A^6 = 32A = 32A'$

$\Rightarrow k = 32$

14. If $A = \begin{bmatrix} k & 2 \\ 2 & k \end{bmatrix}$ and $|A^3| = 125$, then the value of k is

(1) ± 2 (2) ± 3 (3) -5 (4) -4

Ans (2)

$|A| = k^2 - 4$

$\therefore\ (k^2 - 4)^3 = 5^3$

$k = \pm 3$

15. If A is a square matrix satisfying the equation $A^2 - 5A + 7I = 0$, where I is the identity matrix and 0 is null matrix of same order, then $A^{-1} =$

(1) $\frac{1}{7}(5I - A)$ (2) $\frac{1}{7}(A - 5I)$ (3) $7(5I - A)$ (4) $\frac{1}{5}(7I - A)$

Ans (1)

$A^2 - 5A + 7I = 0$

$\Rightarrow A^{-1}AA - 5A^{-1}A + 7A^{-1}I = 0$

$\Rightarrow A - 5I + 7A^{-1} = 0$

$\Rightarrow A^{-1} = \frac{1}{7}[5I - A]$

16. If A is a square matrix of order 3×3, det A = 3, then the value of det $(3A^{-1})$ is

(1) $\frac{1}{3}$ (2) 3 (3) 27 (4) 9

Ans (4)

$|A| = 3$

$\therefore \left|3A^{-1}\right| = 27\frac{1}{|A|} = \frac{27}{3} = 9$

17. If $B = \begin{bmatrix} 1 & 3 \\ 1 & \alpha \end{bmatrix}$ be the adjoint of a matrix A and $|A| = 2$, then the value of α is

(1) 4 (2) 5 (3) 2 (4) 3

Ans (2)

$$B = \begin{bmatrix} 1 & 3 \\ 1 & \alpha \end{bmatrix}$$

$|B| = \alpha - 3$

Given B = adj A

$|B| = |\text{adj } A| = |A|$

$\alpha - 3 = 2$

$\alpha = 5$

18. The system of equations 4x + 6y = 5 and 8x + 12y = 10 has

(1) No solution
(2) Infinitely many solutions
(3) A unique solution
(4) Only two solutions

Ans (2)

4x + 6y = 5

8x + 12y = 10

$\frac{4}{8} = \frac{6}{12} = \frac{5}{10}$

19. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + 4\hat{k}$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then the value of λ is

(1) 1
(2) $\pm$ 1
(3) $-$ 1
(4) 0

Ans (3)

$\vec{a} \cdot \vec{c} + \lambda(\vec{b} \cdot \vec{c}) = 0$

$4 + \lambda(4) = 0$

$\lambda = -1$

20. If $|\vec{a}| = 10, |\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 12$, then the value of $|\vec{a} \times \vec{b}|$ is

(1) 5
(2) 10
(3) 14
(4) 16

Ans (4)

$|\vec{a} \times \vec{b}| = \sqrt{|\vec{a}|^2 |\vec{b}|^2 - (\vec{a} \cdot \vec{b})^2}$

$= \sqrt{400 - 144}$

$= \sqrt{256}$

$= 16$

21. Consider the following statements:

Statement (I): If either $|\vec{a}| = 0$ or $|\vec{b}| = 0$, then $\vec{a} \cdot \vec{b} = 0$.

Statement (II): If $\vec{a} \times \vec{b} = \vec{0}$, then $\vec{a}$ is perpendicular to $\vec{b}$.

Which of the following is correct?

(1) Statement (I) is true but Statement (II) is false
(2) Statement (I) is false but Statement (II) is true
(3) Both statement (I) and Statement (II) are true
(4) Both Statement (I) and Statement (II) are false

Ans (1)

22. If a line makes angles 90°, 60° and θ with x, y and z axes respectively, where θ is acute, then the value of θ is

(1) $\frac{\pi}{6}$
(2) $\frac{\pi}{4}$
(3) $\frac{\pi}{3}$
(4) $\frac{\pi}{2}$

Ans (1)

$l^2 + m^2 + n^2 = 1$

$$0+\frac{1}{4}+\cos^2\gamma=1$$

$$\cos^2\gamma=\frac{3}{4}$$

$$\cos\gamma=\frac{\sqrt{3}}{2}\Rightarrow\gamma=\frac{\pi}{6}$$

23. The equation of the line through the point (0, 1, 2) and perpendicular to the line $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{-2}$ is

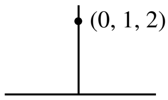
(1) $\frac{x}{3}=\frac{y-1}{4}=\frac{z-2}{-3}$ (2) $\frac{x}{-3}=\frac{y-1}{4}=\frac{z-2}{3}$ (3) $\frac{x}{3}=\frac{y-1}{4}=\frac{z-2}{3}$ (4) $\frac{x}{3}=\frac{y-1}{-4}=\frac{z-2}{3}$

Ans (2)

dr's of given line are 2, 3, –2

dr's of line in option 2, are –3, 4, 3

$\therefore$ 2(–3) + 3(4) + (–2) (3) = –6 + 12 – 6 = 0



24. A line passes though (–1, –3) and perpendicular to x + 6y = 5. Its x intercept is

(1) $\frac{1}{2}$ (2) $-\frac{1}{2}$ (3) –2 (4) 2

Ans (2)

Given x + 6y – 5 = 0

The perpendicular line is 6x – y + k = 0

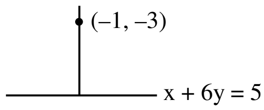
At (–1, –3) $\Rightarrow$ 6(–1) – (–3) + k = 0

$\Rightarrow$ –6 + 3 + k = 0

$\Rightarrow$ k = 3

We have 6x – y + 3 = 0

$\therefore$ x-intercept is $-\frac{1}{2}$



25. The length of the latus rectum of $x^2 + 3y^2 = 12$ is

(1) $\frac{2}{3}$ units (2) $\frac{1}{3}$ units (3) $\frac{4}{\sqrt{3}}$ units (4) 24 units

Ans (3)

$x^2 + 3y^2 = 12$

$$\frac{x^2}{12}+\frac{y^2}{4}=1$$

$a^2 = 12$ $b^2 = 4$

$a = 2\sqrt{3}$ $b = 2$

$$\text{Length of LR}=\frac{2b^2}{a}=\frac{2(4)}{2\sqrt{3}}=\frac{4}{\sqrt{3}}$$

26. $\lim\limits_{x\to 1}\frac{x^4-\sqrt{x}}{\sqrt{x}-1}$ is

(1) 0 (2) 7 (3) does not exist (4) $\frac{1}{2}$

Ans (2)

$$\lim_{x\to 1}\left(\frac{x^4-\sqrt{x}}{\sqrt{x}-1}\right)$$

$$=\lim_{x\to 1}\left(\frac{4x^3-\frac{1}{2\sqrt{x}}}{\frac{1}{2\sqrt{x}}}\right) \qquad \text{(L'Hospital's rule)}$$

$$=\frac{4-\frac{1}{2}}{\frac{1}{2}}=\frac{\frac{7}{2}}{\frac{1}{2}}=7$$

27. If $y=\frac{\cos x}{1+\sin x}$, then

(a) $\frac{dy}{dx}=\frac{-1}{1+\sin x}$

(b) $\frac{dy}{dx}=\frac{1}{1+\sin x}$

(c) $\frac{dy}{dx}=-\frac{1}{2}\sec^2\left(\frac{\pi}{4}-\frac{x}{2}\right)$

(d) $\frac{dy}{dx}=\frac{1}{2}\sec^2\left(\frac{\pi}{4}-\frac{x}{2}\right)$

(1) Only b is correct

(2) Only a is correct

(3) Both a and c are correct

(4) Both b and d are correct

Ans (3)

$$y=\frac{\cos x}{1+\sin x}$$

$$\frac{dy}{dx}=\frac{-\sin x(1+\sin x)-\cos x(\cos x)}{(1+\sin x)^2}$$

$$\frac{dy}{dx}=\frac{-\sin x-\sin^2 x-\cos^2 x}{(1+\sin x)^2}$$

$$\frac{dy}{dx}=\frac{-\sin x-1}{(1+\sin x)^2}=\frac{-(1+\sin x)}{(1+\sin x)^2}$$

$$\frac{dy}{dx}=\frac{-1}{(1+\sin x)}$$

$$\frac{dy}{dx}=\frac{-1}{1+\cos\left(\frac{\pi}{2}-x\right)}$$

$$=\frac{-1}{2\cos^2\left(\frac{\pi}{4}-\frac{x}{2}\right)}$$

$$=-\frac{1}{2}\sec^2\left(\frac{\pi}{4}-\frac{x}{2}\right)$$

28. Match the following:

In the following, [x] denotes the greatest integer less than or equal to x.

Column I		Column II	
(a)	$x\|x\|$	(i)	continuous in (–1, 1)
(b)	$\sqrt{\|x\|}$	(ii)	differentiable in (–1, 1)
(c)	$x + [x]$	(iii)	strictly increasing in (–1, 1)
(d)	$\|x - 1\| + \|x + 1\|$	(iv)	not differentiable at, atleast one point in (–1, 1)

(1) a – i, b – ii, c – iv, d – iii
(2) a – iv, b – iii, c – i, d – ii
(3) a – ii, b – iv, c – iii, d – i
(4) a – iii, b – ii, c – iv, d – i

Ans (3)

29. The function $f(x)=\begin{cases} e^x + ax, & x<0 \\ b(x-1)^2, & x\ge 0 \end{cases}$ is differentiable at x = 0. Then

(1) a = 1, b = 1
(2) a = 3, b = 1
(3) a = –3, b = 1
(4) a = 3, b = –1

Ans (3)

$$f(x)=\begin{cases} e^x + ax, & x<0 \\ b(x-1)^2, & x\ge 0 \end{cases}$$

f is differentiable at x = 0, then

$LHD|_{x=0} = RHD|_{x=0}$

$e^x + a|_{x=0} = 2b(x-1)|_{x=0}$

$e^0 + a = 2b(0 - 1)$

$e^0 + a = -2b$

$1 + a = -2b$

30. A function $f(x)=\begin{cases} \dfrac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}, & \text{if} \quad x\ne 0 \\ 0, & \text{if} \quad x=0 \end{cases}$, is

(1) continuous at x = 0
(2) not continuous at x = 0
(3) differentiable at x = 0
(4) differentiable at x = 0, but not continuous at x = 0

Ans (2)

$$LHL = \lim_{x\to 0^-}\left(\frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}\right) = -1$$

$$RHL = \left(\lim_{x\to 0^+}\left(\frac{e^{1/x}-1}{e^{1/x}+1}\right) = \lim_{x\to 0^+}\left(\frac{e^{1/x}\left(1-e^{-1/x}\right)}{e^{1/x}\left(1+e^{-1/x}\right)}\right)\right)$$

$= 1$

$LHL \ne RHL$

31. If y = a $\sin^3 t$, x = a $\cos^3 t$, then $\frac{dy}{dx}$ at $t = \frac{3\pi}{4}$ is

(1) –1 (2) $\frac{1}{\sqrt{3}}$ (3) $-\sqrt{3}$ (4) 1

Ans (4)

y = a $\sin^3 t$ and x = a $\cos^3 t$

$$\frac{dy}{dx} = \frac{a(3\sin^2 t)\cos t}{a(3\cos^2 t)(-\sin t)}$$

$= -\tan t$

at $t = \frac{3\pi}{4}$

$= -\tan\frac{3\pi}{4}$

$= -(-1) = 1$

32. The derivative of sin x with respect to log x is

(1) cos x (2) x cos x (3) $\frac{\cos x}{\log x}$ (4) $\frac{\cos x}{x}$

Ans (2)

u = sin x, v = log x

$$\frac{du}{dv} = \frac{\cos x}{\frac{1}{x}} = x\cos x$$

33. The minimum value of 1 – sin x is

(1) 0 (2) –1 (3) 1 (4) 2

Ans (1)

$-1 \le \sin x \le 1$

$1 \ge -\sin x \ge 1$

(or) $-1 \le -\sin x \le 1$

$0 \le 1 - \sin x \le 2$

Minimum value is '0'.

34. The function f(x) = tan x – x

(1) always increases (2) always decreases

(3) never increases (4) neither increases nor decreases

Ans (1)

f(x) = tan x – x

$f'(x) = \sec^2 x - 1 \ge 0$

35. The value of $\int \frac{dx}{(x+1)(x+2)}$ is

(1) $\log\left|\frac{x-1}{x+2}\right| + c$ (2) $\log\left|\frac{x-1}{x-2}\right| + c$ (3) $\log\left|\frac{x+2}{x+1}\right| + c$ (4) $\log\left|\frac{x+1}{x+2}\right| + c$

Ans (4)

$$\int \frac{dx}{(x+1)(x+2)}$$

$$\frac{1}{(x+1)(x+2)} = \frac{\frac{1}{1}}{x+1} + \frac{\frac{1}{-1}}{x+2}$$

$$\int \frac{1}{(x+1)(x+2)} dx = \log|x+1| - \log|x+2|$$

$$= \log\left|\frac{x+1}{x+2}\right| + c$$

36. The value of $\int_{-1}^{1} \sin^5 x \cos^4 x \, dx$ is

(1) $-\frac{\pi}{2}$ (2) π (3) $\frac{\pi}{2}$ (4) 0

Ans (4)

$$\int_{-1}^{1} \sin^5 x \cos^4 x \, dx$$

$f(x) = \sin^5 x \cdot \cos^4 x$

$f(-x) = \sin^5(-x)\cos^4(-x)$

$= -\sin^5 x \cos^4 x$

$= -f(x)$

f(x) is odd function

$$\therefore \int_{-1}^{1} \sin^5 x \cos^4 x \, dx = 0$$

37. The value of $\int_{0}^{2\pi} \sqrt{1+\sin\left(\frac{x}{2}\right)} dx$ is

(1) 8 (2) 4 (3) 2 (4) 0

Ans (1)

$$\int_{0}^{2\pi} \sqrt{1+\sin\left(\frac{x}{2}\right)} dx$$

$$\int_{0}^{2\pi} \sqrt{\sin^2\frac{x}{4} + \cos^2\frac{x}{4} + 2\sin\frac{x}{4}\cos\frac{x}{4}} \, dx$$

$$\int_{0}^{2\pi} \sqrt{\left(\sin\frac{x}{4} + \cos\frac{x}{4}\right)^2} \, dx$$

$$= \int_{0}^{2\pi} \left(\sin\frac{x}{4} + \cos\frac{x}{4}\right) dx$$

$$= \left.\frac{-\cos\frac{x}{4}}{\frac{1}{4}} + \frac{\sin\frac{x}{4}}{\frac{1}{4}}\right)_{0}^{2\pi}$$

$= 4\{(-0 + 1) - (-1 + 0)\} = 4(2) = 8$

38. $\int \frac{dx}{x^2(x^4+1)^{3/4}}$ equals

(1) $\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+c$ (2) $(x^4+1)^{\frac{1}{4}}+c$ (3) $-(x^4+1)^{\frac{1}{4}}+c$ (4) $-\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}}+c$

Ans (4)

$\int \frac{dx}{x^2(x^4+1)^{3/4}}$

$$=\int \frac{dx}{x^2\left\{x^4\left(1+\frac{1}{x^4}\right)\right\}^{3/4}}$$

$$=\int \frac{dx}{x^2\cdot x^3\left(1+\frac{1}{x^4}\right)^{3/4}}=\int \frac{\frac{1}{x^5}}{\left(1+\frac{1}{x^4}\right)^{3/4}}dx$$

$$=\frac{1}{-4}\int \frac{-\frac{4}{x^5}}{\left(1+\frac{1}{x^4}\right)^{3/4}}dx$$

$$=-\frac{1}{4}\left\{\frac{-1}{-\frac{1}{4}\left(1+\frac{1}{x^4}\right)^{-\frac{1}{4}}}\right\}+c$$

$$=-\left(1+\frac{1}{x^4}\right)^{\frac{1}{4}}+c \quad =-\left(\frac{x^4+1}{x^4}\right)^{1/4}+c$$

39. $\int_0^1 \log\left(\frac{1}{x}-1\right)dx$ is

(1) 1 (2) 0 (3) $\log_e 2$ (4) $\log_e\left(\frac{1}{2}\right)$

Ans (2)

$\int_0^1 \log\left(\frac{1}{x}-1\right)dx$

$I=\int_0^1 \log\left(\frac{1-x}{x}\right)dx$

$I=\int_0^1 \log(1-x)-\log x\,dx \quad \ldots (1)$

$$=\int_0^1 \left(\log(1-(1-x))-\log(1-x)\right)dx$$

$$=\int_0^1 \left(\log(x)-\log(1-x)\right)dx$$

$$=-\int_0^1 \left(\log(1-x)-\log x\right)dx$$

$I=-I \Rightarrow 2I=0 \Rightarrow I=0$

40. The area bounded by the curve $y = \sin\left(\frac{x}{3}\right)$, x axis, the lines x = 0 and x = 3π is

(1) 9 sq. units (2) $\frac{1}{3}$ sq. units (3) 6 sq. units (4) 3 sq. units

Ans (3)

$$y = \sin\left(\frac{x}{3}\right)$$

$$\text{Area} = \int_0^{3\pi} \sin\left(\frac{x}{3}\right) dx$$

$$= -\left.\frac{\cos\left(\frac{x}{3}\right)}{\frac{1}{3}}\right)_0^{3\pi}$$

$$= -3\,(\cos\pi - \cos 0)$$

$$= -3\,(-1 - 1) = 6$$

41. The area of the region bounded by the curve y = x^2 and the line y = 16 is

(1) $\frac{32}{3}$ sq. units (2) $\frac{256}{3}$ sq. units (3) $\frac{64}{3}$ sq. units (4) $\frac{128}{3}$ sq. units

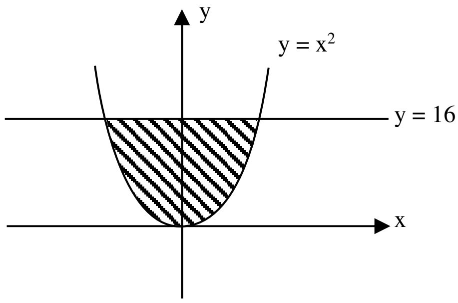
Ans (2)

$$A = \int_0^{16} x\,dy$$

$$= 2\int_0^{16} \sqrt{y}\,dy$$

$$= 2.\frac{y^{\frac{3}{2}}}{\frac{3}{2}}\int_0^{16} \frac{4}{3}\left[16^{\frac{3}{2}} - 0\right]$$

$$= \frac{4}{3}[64] = \frac{256}{3}\text{sq units}$$



42. General solution of the differential equation $\frac{dy}{dx} + y\tan x = \sec x$ is

(1) y sec x = tan x + c (2) y tan x = sec x + c

(3) cosec x = y tan x + c (4) x sec x = tan y + c

Ans (1)

$$\frac{dy}{dx} + y\tan x = \sec x$$

P (x) = tan x Q (x) = sec x

I.F = $e^{\int P\,dx} = e^{\int \tan x\,dx} = e^{\log_e \sec x} = \sec x$

G.S is y (I.F) = $\int Q.(I.F)dx$

y sec x = $\int \sec x.\sec x\,dx$

$\Rightarrow$ y sec x = $\int \sec^2 x\,dx$

y sec x = tan x + c

43. If ‘a’ and ‘b’ are the order and degree respectively of the differential equation

$\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^3 + x^4 = 0$, then a – b = ____________

(1) 1 (2) 2 (3) –1 (4) 0

Ans (4)

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

Order = a = 2

Degree = b = 2

a – b = 0

44. The distance of the point P(–3, 4, 5) from yz plane is

(1) 4 units (2) 5 units (3) –3 units (4) 3 units

Ans (4)

P = (–3, 4, 5)

Q = (0, 4, 5)

PQ = $\sqrt{(-3-0)^2 + (4-4)^2 + (5-5)^2}$

= $\sqrt{9+0+0}$ = 3 units

45. If A = {x: x is an integer and $x^2 - 9 = 0$}

B = {x: x is a natural number and $2 \le x < 5$}

C = {x: x is a prime number ≤ 4}

Then (B – C) ∪ A is,

(1) {–3, 3, 4} (2) {2, 3, 4} (3) {3, 4, 5} (4) {2, 3, 5}

Ans (1)

A = {3, –3}

B = {2, 3, 4}

C = {2, 3}

B – C = {4}

(B – C) ∪ A = {3, –3, 4}

46. A and B are two sets having 3 and 6 elements respectively.

Consider the following statements.

Statement (I): Minimum number of elements in A ∪ B is 3

Statement (II): Maximum number of elements in A ∩ B is 3

Which of the following is correct?

(1) Statement (I) is true, statement (II) is false

(2) Statement (I) is false, statement (II) is true

(3) Both statements (I) and (II) are true

(4) Both statements (I) and (II) are false

Ans (2)

n (A) = 3

n (B) = 6

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$n(A \cup B) = 9 - n(A \cap B)$

But $0 \le n(A \cap B) \le 3$

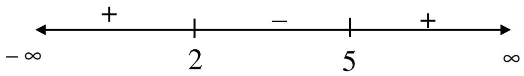
$\therefore$ Statement I is false and statement II is true

47. Domain of the function f, given by $f(x) = \dfrac{1}{\sqrt{(x-2)(x-5)}}$ is

(1) $(-\infty, 2] \cup [5, \infty)$ (2) $(-\infty, 2) \cup (5, \infty)$ (3) $(-\infty, 3) \cup [5, \infty)$ (4) $(-\infty, 3] \cup (5, \infty)$

Ans (2)

$f(x) = \dfrac{1}{\sqrt{(x-2)(x-5)}}$



$\Rightarrow (x-2)(x-5) > 0$

Domain = $(-\infty, 2) \cup (5, \infty)$

48. If $f(x) = \sin[\pi^2]x - \sin[-\pi^2]x$, where [x] = greatest integer $\le$ x, then which of the following is not true?

(1) f(0) = 0 (2) $f\left(\dfrac{\pi}{2}\right) = 1$ (3) $f\left(\dfrac{\pi}{4}\right) = 1 + \dfrac{1}{\sqrt{2}}$ (4) $f(\pi) = -1$

Ans (4)

$f(x) \sin[\pi^2]x - \sin[-\pi^2]x$

$f(x) = \sin 9x - \sin(-10x)$

$= \sin 9x + \sin 10x$

$f(0) = \sin 0 + \sin 0 = 0$

$f\left(\dfrac{\pi}{2}\right) = \sin\dfrac{9\pi}{2} + \sin 5\pi$

$= 1 + 0 = 1$

$f\left(\dfrac{\pi}{4}\right) = \sin\dfrac{9\pi}{4} + \sin\dfrac{10\pi}{4}$

$= \sin 405° + \sin 450°$

$= \dfrac{1}{\sqrt{2}} + 1$

$f(\pi) = \sin 9\pi + \sin 10\pi$

$= \sin 1620 + \sin 1800$

$= 0 + 0 = 0$

49. Which of the following is not correct?

(1) $\cos 5\pi = \cos 4\pi$ (2) $\sin 2\pi = \sin(-2\pi)$ (3) $\sin 4\pi = \sin 6\pi$ (4) $\tan 45° = \tan(-315°)$

Ans (1)

(1) $\cos[900°] \ne \cos[720°]$

(2) $\sin[360°] = \sin[-360°]$

(3) $\sin[720°] = \sin[1080°]$

(4) $\tan[45°] = \tan(-315°)$

50. If $\cos x + \cos^2 x = 1$, then the value of $\sin^2 x + \sin^4 x$ is

(1) –1 (2) 1 (3) 0 (4) 2

Ans (2)

$\cos x + \cos^2 x = 1$

$\cos x = 1 - \cos^2 x$

$\cos x = \sin^2 x$

$\therefore \sin^2 x + \sin^4 x = \cos x + \cos^2 x = 1$

51. The mean deviation about the mean for the data 4, 7, 8, 9, 10, 12, 13, 17 is

(1) 10 (2) 3 (3) 8.5 (4) 4.03

Ans (2)

$\bar{x} = \frac{80}{8} = 10$

$MD(\bar{x}) = \frac{\sum |x_i - \bar{x}|}{n} = \frac{24}{8} = 3$

52. A random experiment has five outcomes w_1, w_2, w_3, w_4 and w_5. The probabilities of the occurrence of the outcomes w_1, w_2, w_4 and w_5 are respectively $\frac{1}{6}$, a, b and $\frac{1}{12}$ such that 12a + 12b – 1 = 0. Then the probabilities of occurrence of the outcomes w_3 is

(1) $\frac{2}{3}$ (2) $\frac{1}{3}$ (3) $\frac{1}{6}$ (4) $\frac{1}{12}$

Ans (1)

$12a + 12b = 1 \rightarrow a + b = \frac{1}{12}$

$\frac{1}{6} + a + b + P(w_3) + \frac{1}{12} = 1$

$\Rightarrow P(w_3) = 1 - \frac{1}{6} - \frac{1}{12} - (a+b) = \frac{12-2-1-1}{12} = \frac{2}{3}$

53. A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If the die is rolled once, then P(1 or 3) is

(1) $\frac{2}{3}$ (2) $\frac{1}{2}$ (3) $\frac{1}{3}$ (4) $\frac{1}{6}$

Ans (2)

$P(1) = \frac{2}{6} = \frac{1}{3}$; $P(2) = \frac{3}{6} = \frac{1}{2}$; $P(3) = \frac{1}{6}$

$P(1 \text{ or } 3) = P(1) + P(3) = \frac{1}{3} + \frac{1}{6} = \frac{1}{2}$

54. Let A = {a, b, c}, then the number of equivalence relations on A containing (b, c) is

(1) 1 (2) 3 (3) 2 (4) 4

Ans (3)

$R_1 = \{(a,a),(b,b),(c,c),(b,c),(c,b)\}$

$R_2 = \{(a,a),(b,b),(c,c),(b,c),(c,b),(a,c),(c,a),(a,b),(b,a)\}$

55. Let the functions "f" and "g" be $f:\left[0,\frac{\pi}{2}\right]\to\mathbf{R}$ given by $f(x)=\sin x$ and $g:\left[0,\frac{\pi}{2}\right]\to\mathbf{R}$ given by $g(x) = \cos x$, where **R** is the set of real numbers

Consider the following statements:

Statement (I): f and g are one-one

Statement (II): f + g is one-one

Which of the following is correct?

(1) Statement (I) is true, statement (II) is false

(2) Statement (I) is false, statement (II) is true

(3) Both statements (I) and (II) are true

(4) Both statements (I) and (II) are false

Ans (1)

56. $\sec^2\left(\tan^{-1}2\right)+\operatorname{cosec}^2\left(\cot^{-1}3\right)=$

(1) 1 (2) 5 (3) 15 (4) 10

Ans (3)

$\sec^2\left(\tan^{-1}2\right)+\operatorname{cosec}^2\left(\cot^{-1}3\right)=1+2^2+1+3^2=15$

57. $2\cos^{-1}x=\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ is valid for all values of 'x' satisfying

(1) $0\le x\le\frac{1}{\sqrt{2}}$ (2) $-1 \le x \le 1$ (3) $0 \le x \le 1$ (4) $\frac{1}{\sqrt{2}}\le x\le 1$

Ans (4)

$2\cos^{-1}x=\sin^{-1}\left(2x\sqrt{1-x^2}\right),\ \frac{1}{\sqrt{2}}\le x\le 1$

58. Consider the following statements:

Statement (I): In a LPP, the objective function is always linear.

Statement (II): In a LPP, the linear inequalities on variables are called constraints.

Which of the following is correct?

(1) Statement (I) is true, Statement (II) is true

(2) Statement (I) is true, Statement (II) is false

(3) Both Statements (I) and (II) are false

(4) Statement (I) is false, Statement (II) is true

Ans (1)

59. The maximum value of $Z = 3x + 4y$, subject to the constraints $x + y \le 40$, $x + 2y \le 60$ and $x, y \ge 0$ is

(1) 130 (2) 120 (3) 140 (4) 40

Ans (3)

Corner points (40, 0), (0, 30), (20, 20), (0, 0)

$Z_{(40,\,0)} = 120$

$Z_{(0,\,30)} = 120$

$Z_{(20,\,20)} = 140$

$Z_{(0,\,0)} = 0$

$\therefore$ The maximum value is 140

60. Consider the following statements.

Statement (I): If E and F are two independent events, then E′ and F′ are also independent.

Statement (II): Two mutually exclusive events with non-zero probabilities of occurrence cannot be independent.

Which of the following is correct?

(1) Statement (I) is true and statement (II) is false

(2) Statement (I) is false and statement (II) is true

(3) Both the statements are true

(4) Both the statements are false

Ans (3)

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