K-CET EXAMINATION – 2026

MATHEMATICS – D4 with Key & Solutions

1. $\tan^{-1}\left(\frac{1}{1+1x2}\right)+\tan^{-1}\left(\frac{1}{1+2x3}\right)+....+\tan^{-1}\left(\frac{1}{1+n(n+1)}\right)=$

(1) $\tan^{-1}\left(\frac{n}{n+2}\right)$ (2) $\tan^{-1}\left(\frac{n+1}{n}\right)$

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

Ans. (1)

Sol. $\tan^{-1}\left(\frac{2-1}{1+(1)(2)}\right)+\tan^{-1}\left(\frac{3-2}{1+(2)(3)}\right)+......$

$+\tan^{-1}\left(\frac{n+1-n}{1+(n)(n+1)}\right)$

$=\tan^{-1}(2)-\tan^{-1}(1)+\tan^{-1}(3)-\tan^{-1}(2)+$

$....\tan^{-1}(n+1)-\tan^{-1}(n)$

$=\tan^{-1}(n+1)-\tan^{-1}(1)=\tan^{-1}\left(\frac{n}{n+2}\right).$

2. The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5), (15, 15), (0, 20). Let z = px + qy where p, q > 0. The relation between p and q, so that the maximum z occurs at both points (15, 15) and (0, 20) is

(1) p = q (2) p = 2q

(3) q = 2p (4) q = 3p

Ans. (4)

Sol. Z at (15, 15) is 15p + 15 q

Z at (0, 20) is 20 q

Here 15p + 15q = 20 q

15p = 5q ⇒ q = 3p.

3. In Linear Programming Problem (LPP), the objective function Z = ax + by has the same maximum value at two corner points. The number of points at which Z_{max} occurs is

(1) 1 (2) 2

(3) 0 (4) Infinity

Ans. (4)

Sol. By definition.

4. Probability of obtaining an even prime number on each die when a pair of dice is rolled is

(1) 0 (2) $\frac{1}{6}$

(3) $\frac{1}{12}$ (4) $\frac{1}{36}$

Ans. (4)

Sol. $E=\{(2,2)\}$

n(E) = 1

n (s) = 36

$P(E)=\frac{n(E)}{n(s)}=\frac{1}{36}.$

5. The probability that a man and his wife live after 20 years are $\frac{1}{4}$ and $\frac{1}{3}$ respectively. The probability that neither the man nor his wife live after 20 years is

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

(3) $\frac{7}{12}$ (4) $\frac{1}{2}$

Ans. (4)

Sol. $P(E)=\frac{1}{4}$

$P(F)=\frac{1}{3}$

$P(E')=\frac{3}{4}$

$P(F')=\frac{2}{3}$

P (Neither E or F)

$P(E'\cap F')=P(E')P(F')$

(By independent events)

$=\frac{3}{4}x\frac{2}{3}=\frac{1}{2}.$

6. Integrating factor of the differential equation $(1-x^2)\frac{dy}{dx}-xy=1$ is

(1) $1-x^2$ (2) $\frac{1}{2}\log|1-x^2|$

(3) $\frac{x}{1+x^2}$ (4) $\sqrt{1-x^2}$

Ans. (4)

Sol. $\frac{dy}{dt}+\left(\frac{-x}{1-x^2}\right)y=\frac{1}{1-x^2}$

$P = \frac{-x}{1-x^2}$

$I.F = e^{\int P dx}$

$= e^{\int \frac{-x}{1-x^2} dx}$

$= e^{\frac{1}{2}\log(1-x^2)} = \sqrt{1-x^2}$.

7. Recent studies suggest that 12% of the world population is left handed. Depending on parents hand usage, the chances of having left handed children are as follows:
A: Both parents are left handed, chances of having left handed children= 24%
B: Both parents are right handed, chances of having left handed children = 9%
C: Father left handed and mother right handed, chances of having left handed children = 17%
D: Father right handed and mother left handed, chances of having left handed children = 22%
Given P(A) = P(B) = P(C) = P(D) = 1/4 and L denotes child is left handed. What is the probability that P(A|L)?

(1) $\frac{17}{100}$ (2) $\frac{19}{25}$
(3) $\frac{1}{3}$ (4) $\frac{2}{3}$

Ans. (3)

Sol. $P(A) = P(B) = P(C) = P(D) = \frac{1}{4}$

$P(E/A) = \frac{24}{100}, P(E/B) = \frac{9}{100}$

$P(E/C) = \frac{17}{100}, P(E/D) = \frac{22}{100}$

By Baye's theorem

$$P(E/A) = \frac{P(A)P(E/A)}{P(A)P(E/A)+P(B)P(E/B)+P(C)P(E/C)+P(D)P(E/D)}$$

$$= \frac{\left(\frac{1}{4}\right)\left(\frac{24}{100}\right)}{\left(\frac{1}{4}\right)\left(\frac{24}{100}\right)+\left(\frac{1}{4}\right)\left(\frac{9}{100}\right)+\left(\frac{1}{4}\right)\left(\frac{17}{100}\right)+\left(\frac{1}{4}\right)\left(\frac{22}{100}\right)}$$

$$= \frac{\frac{24}{400}}{\frac{72}{400}} = \frac{1}{3}.$$

8. If α and β are acute angles such that $\alpha+\beta$ and $\alpha-\beta$ satisfy the equation $\tan^2\theta - 4\tan\theta + 1 = 0$, then α and β are respectively,

(1) 45°, 30° (2) 30°, 45°
(3) 30°, 60° (4) 60°, 45°

Ans. (1)

Sol. Take $x = \tan\theta$

$x^2 - 4x + 1 = 0$

$x = 2 \pm \sqrt{3}$

$\tan(\alpha+\beta) = 2+\sqrt{3}$ and $\tan(\alpha-\beta) = 2-\sqrt{3}$

$\therefore \alpha+\beta = 75^\circ$

$\alpha-\beta = 15^\circ$

$\alpha = 45^\circ$

$\beta = 30^\circ$.

9. $\sum_{n=1}^{4}\left(\sqrt{-1}\right)^{2n} =$ ________

(1) 2 (2) -i
(3) 0 (4) i

Ans. (3)

Sol. $\sum_{n=1}^{4}\left(\sqrt{-1}\right)^{2n}$

$= (i)^2 + i^4 + i^6 + i^8$

$= -1+1-1+1 = 0$

10. The solution of $3(x-1) \le 2(x-3)$ is

(1) $x \le -3$ (2) $x \ge -3$
(3) $x \le 3$ (4) $x \ge 3$

Ans. (1)

Sol. $3(x-1) \le 2(x-3)$

$3x - 3 \le 2x - 6$

$3x - 2x \le -6 + 3$

$x \le -3$.

11. 10 distinct points are taken on a circle. Then using these points
Statement I : The number of triangles that can be formed is 100
Statement II : The number of chords that can be formed is 45
Which of the following is correct?
(1) Both Statement I and Statement II are true
(2) Both Statement I and Statement II are false
(3) Statement I is true and Statement II is false
(4) Statement I is false and Statement II is true

Ans. (4)

Sol. Statement I: No of triangles

$= {}^{10}C_3 = \frac{10\times9\times8}{3\times2\times1} = 120$

Statement II: No of chords

$= {}^{10}C_2 = \frac{10\times9}{2\times1} = 45$

Statement I is False, Statement II is true

12. How many ways can you arrange all the letters and numbers in "KCET 2025" which start with K and end with 5?
(1) 720
(2) 360
(3) 120
(4) 180

Ans. (2)

Sol.

K							5

No. of ways = $\frac{6!}{2!} = \frac{720}{2} = 360$

13. The value at x = 2 for $\frac{x^3+3x^2+3x+1}{x^4+4x^3+6x^2+4x+1} = ?$
(1) 3 (2) 25/61
(3) 1/3 (4) 19/73

Ans. (3)

Sol. $\frac{(x+1)^3}{(x+1)^4} = \frac{1}{x+1} = \frac{1}{2+1} = \frac{1}{3}$

14. If we insert two numbers between $\sqrt{2}$ and 4 so that resulting sequence is in G.P, then the inserted number in the order are
(1) $8, \sqrt{2}$
(2) $2, \sqrt{8}$
(3) $\sqrt{8}, 2$
(4) $\sqrt{2}, 8$

Ans. (2)

Sol. $\sqrt{2}$ G_1, G_2, 4

$t_1 = a = \sqrt{2}$

$t_4 = ar^3 = 4$

$\Rightarrow \sqrt{2}r^3 = 2\times 2 \Rightarrow r^3 = 2\sqrt{2}$

r = $\sqrt{2}$

$\therefore t_2 = G_1 = ar = \sqrt{2}\,\sqrt{2} = 2$

$t_3 = G_2 = ar^2 = \sqrt{2}\left(\sqrt{2}^2\right) = 2\sqrt{2} = \sqrt{8}$

15. Match List-I with List-II

	List – I		List – II
a.	A matrix which is not a square matrix	i)	Symmetric matrix
b.	A square matrix $A' = A$	ii)	Null matrix
c.	The diagonal elements of a diagonal matrix are same	iii)	Rectangular matrix
d.	A matrix which is both symmetric and skew symmetric	iv)	Scalar matrix

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

Ans. (3)

Sol. a – iii, b – i, c – iv, d – ii

16. Consider the following statements:
Statement I: If A is a non-singular matrix, then A^{-1} exists.
Statement II: If A and B are symmetric matrices of same order, then (AB - BA) is a skew symmetric matrix
Choose the correct option.
(1) Statement I is true and Statement II is false
(2) Statement I is false and Statement II is false
(3) Statement I is true and Statement II is true
(4) Statement I is false and Statement II is true

Ans. (3)

Sol. Statement I is true and Statement II is true

17. A row matrix has only
(1) One element
(2) One row with one or more columns
(3) One column with one or more rows
(4) One row and one column

Ans. (2)

Sol. A row matrix has only one row with one or more columns

18. Let X be a matrix of order $2\times n$ and Z be a matix of order $2\times p$. If n = p, then the order of the matrix 8X – 9Z is
(1) $2\times n$
(2) $p\times 2$
(3) $n\times 3$
(4) $p\times n$

Ans. (1)

Sol. Given order of X = $2\times n$

Order of Z = $2\times p$

$X_{2\times n}$ $Z_{2\times p}$ If $n = p$

Order of matrix 8X – 9Z = $2\times n$

19. Which of the following is correct?
(1) Determinant is a square matrix
(2) Determinant is a number associated to a matrix
(3) Determinant is a unique number associated to a square matrix
(4) Determinant is not defined for a square matrix

Ans. (3)

Sol. Determinant is a unique number associated to a square matrix

20. If A and B are invertible matrices of same order, then which of the following is not correct?
(1) A. (adj A) = (adj A) . A = AI
(2) A(adj A) = (adj A) . A = |A|I
(3) $(AB)^{-1} = B^{-1}A^{-1}$
(4) $|A| \neq 0, |B| \neq 0$

Ans. (1)

Sol. A. (adj A) = (adj A) . A = AI

21. If A and B are invertible square matrices of order n, then which of the following is not correct?
(1) det (AB) = det (A). det (B)
(2) det (kA) = k^n det (A)
(3) det (A + B) = det (A) + det (B)
(4) det (A') = $\frac{1}{\det(A^{-1})}$

Ans. (3)
Sol. det (A + B) $\neq$ det (A) + det (B)
By observation

22. The area of the triangle with vertices (3, 8), (-4, 2) and (5, 1) is $\frac{P}{4}$, then the value of Pis
(1) $\frac{61}{2}$ (2) $\frac{2}{61}$
(3) 122 (4) $\frac{1}{122}$

Ans. (3)
Sol. $\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$

$\frac{p}{4} = \frac{1}{2}\begin{vmatrix} 3 & 8 & 1 \\ -4 & 2 & 1 \\ 5 & 1 & 1 \end{vmatrix}$

$\pm\frac{P}{2} = 3 + 12 - 14, \pm\frac{P}{2} = 61$, P= $\pm$122 ,P=122

23. The system of equations x + 2y = 3 and 2x + 3y= 3 has
(1) No solution (2) Unique solution
(3) Infinite solutions (4) Only two solutions

Ans. (2)
Sol. x+2y=3, 2x+3y=3
A= $\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$
$|A| = 3 - 4 = -1 \neq 0$, unique solution.

24. If $\vec{a} = 2\hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = \alpha\hat{i} + \beta\hat{j} + 2\hat{k}$ and $|\vec{a}+\vec{b}| = |\vec{a}-\vec{b}|$, then $\alpha + \beta$ is equal to
(1) 2 (2) -1
(3) 0 (4) 1

Ans. (4)
Sol. If $|\vec{a}+\vec{b}| = |\vec{a}-\vec{b}|$,
$\Rightarrow \vec{a} \perp \vec{b}$, $\Rightarrow \vec{a}.\vec{b} = 0$
$2\alpha + 2\beta - 2 = 0$, $\alpha + \beta = 1$

25. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = \hat{j} - \hat{k}$ and $\vec{a}x\vec{c} = \vec{b}, \vec{a}.\vec{c}$ =3, then $\vec{c}$ is
(1) $\frac{5}{3}\hat{i} + \frac{2}{3}\hat{j} - \frac{2}{3}\hat{k}$ (2) $\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} + \frac{2}{3}\hat{k}$
(3) $\frac{5}{3}\hat{i} + \frac{2}{3}\hat{j} + \frac{2}{3}\hat{k}$ (4) $\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} - \frac{2}{3}\hat{k}$

Ans. (3)
Sol. $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = j - \hat{k}$
$\vec{a}x\vec{c} = \vec{b}, \vec{a}.\vec{c} = 3$
$\vec{c} = \frac{5}{3}\hat{i} + \frac{2}{3}\hat{j} + \frac{2}{3}\hat{k}$ is satisfying $\vec{a}.\vec{c} = 3$

26. The value of λ for which the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ are orthogonal is
(1) $\frac{5}{2}$ (2) $\frac{-5}{2}$
(3) $\frac{2}{5}$ (4) $\frac{-2}{5}$

Ans. (2)
Sol. $\vec{a}$ & $\vec{b}$ are orthogonal
$\vec{a}.\vec{b} = 0$, 2+ 2λ +3=0
2λ =-5, $\lambda = \frac{-5}{2}$

27. The angle between the lines whose direction ratios are a, b, c and b - c, c - a, a - b is
(1) 90° (2) 60°
(3) 30° (4) 0°

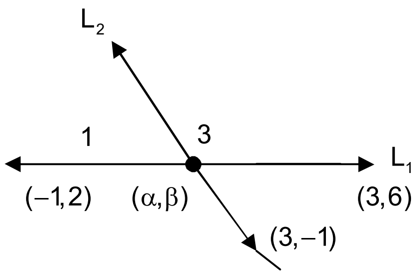
Ans. (1)
Sol. $\vec{p} = a\hat{i} + b\hat{j} + c\hat{k}$
$\vec{q} = (b-c)\hat{i} + (c-a)\hat{j} + (a-b)\hat{k}$
$\vec{p} \perp \vec{q}$ (ab-ac+bc-ba+ac-bc=0)
$\vec{p}.\vec{q} = 0$, $(\vec{p}, \vec{q}) = 90^0$

28. The measure of the angle between the lines x = k + 1, y = 2k - 1, z = 2k + 3, k$\in$R and $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{1}$ is
(1) $\cos^{-1}\left(\frac{2}{3}\right)$ (2) $\cos^{-1}\left(\sqrt{\frac{2}{3}}\right)$
(3) $\cos^{-1}\left(\sqrt{\frac{3}{2}}\right)$ (4) $\cos^{-1}\left(\frac{3}{2}\right)$

Ans. (2)
Sol. $\left.\begin{array}{l} \frac{x-1}{1} = k \\ \frac{y+1}{2} = k \\ \frac{z-3}{2} = k \end{array}\right] \ell_1$

$\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{1}$
$\vec{a} = i + 2j + 2k, \vec{b} = 2\hat{i} + \hat{j} + \hat{k}$
$\cos\theta = \frac{\vec{a}.\vec{b}}{|\vec{a}||\vec{b}|} = \frac{2+2+2}{\sqrt{9}\sqrt{6}} = \frac{\sqrt{6}}{3} = \frac{\sqrt{2}}{\sqrt{3}}$
$\theta = \cos^{-1}\left(\sqrt{\frac{2}{3}}\right)$

29. The line L_1 joining the two points (-1, 2) and (3, 6) divides the line L_2 which passes through (3,-1) in the ratio 1:3 internally, then the equation of L_2 is
(1) 4x – 3y – 9 =0 (2) 4x – 3y + 9 = 0
(3) 4x +3y – 9 = 0 (4) 4x + 3y + 9 = 0
Ans. (3)

Sol.


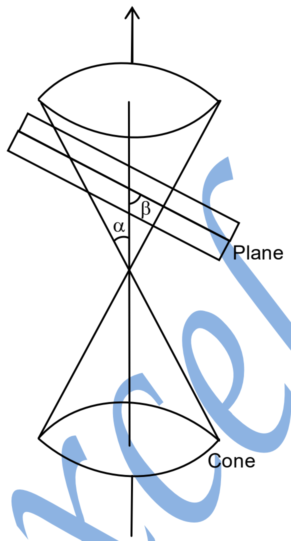
$(\alpha,\beta)=\frac{1(3,6)+3(-1,2)}{1+3}$

$(\alpha,\beta)=(0,3)$

L_2 line passing through (0,3) & (3,-1)

y-3=$\frac{-4}{3}(x-0)$,4x+3y-9=0

30. In the figure
Statement I: When α > ß ≥ 0, the section is Hyperbola.
Statement II: When ß > 90°, the section is ellipse.



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 the Statements are true
(4) Both the Statements are false
Ans. (1)
Sol. By Observation

31. The three points A (2,4,3), B(4,a,9) and C(10,–1,7) form right– angled triangle with $\angle B = 90^0$, then the value of "a" is
(1) 1 or 4
(2) –1 or 4
(3) 1 or –4
(4) –1 or –4
Ans. (2)
Sol. $\vec{AB}=(2,a-4,6)$

$\vec{BC}=(6,-1-a,-2)$

$\vec{AB}\perp$ ar $\vec{BC}$

$\vec{AB}.\vec{BC}=0$

$12+(a-4)(-1-a)-12=0$

$(a-4)(-1-a)=0$

A=4, –1

32. If $\lim_{x\to3}\left(\frac{x^2-ax-3b}{x-3}\right)=5$, then a+b =
(1) 1
(2) 2
(3) 3
(4) 4
Ans. (3)
Sol. $\lim_{x\to3}\left(\frac{x^2-ax-3b}{x-3}\right)=5$

L' Hospital rule

$\lim_{x\to3}\frac{2x-a}{1}=5$

$\Rightarrow 6-a=5$

$a=1$

Also $\lim_{x\to3}\frac{x^2-x-3b}{x-3}=5$

Nr= 0 $\Rightarrow 3^2-3-3b=0$

$6-3b=0\Rightarrow 3b=6\Rightarrow b=2$

$\therefore a+b=3$

33. If f(x) = $\begin{cases}x^2-1 \text{ if } x\ge2\\ x+1 \text{ if } x<2\end{cases}$, then $\lim_{x\to1}f(x)+\lim_{x\to2}f(x)=$
(1) 3 (2) 5
(3) 7 (4) 9
Ans. (2)
Sol. $\lim_{x\to1}f(x)+\lim_{x\to2}f(x)$

$=\lim_{x\to1}x+1+\lim_{x\to2}f(x)=1+1+3 \;=2+3=5$

L.H.L $=\lim_{x\to2^-}f(x)=3$

R.H.L $=\lim_{x\to2^+}f(x)=3$

34. If $y=\sqrt[3]{\tan x+y}$, then $\frac{dy}{dx}=$

(1) $\frac{\tan x}{3y^2-1}$

(2) $\frac{\sec^2 x}{3y-1}$

(3) $\frac{\tan x}{3y-1}$

(4) $\frac{\sec^2 x}{3y^2-1}$

Ans. (4)

Sol. $y=\sqrt[3]{\tan x+y}$

$y^3=\tan x+y$

$3y^2\frac{dy}{dx}=\sec^2 x+\frac{dy}{dx}$

$\frac{dy}{dx}(3y^2-1)=\sec^2 x$

$\frac{dy}{dx}=\frac{\sec^2 x}{3y^2-1}$

35. If $f(x)=\begin{cases} ax+7 & \text{if } x<1 \\ 3x-1 & \text{if } x=1 \\ \frac{x+3}{b} & \text{if } x>1 \end{cases}$

Is continuous at x=1, then

(1) a=5, b=2

(2) a= –5, b= –2

(3) a=5, b= –2

(4) a= –5, b=2

Ans. (4)

Sol. a= –5, b=2

f(x) is continuous at x=1

L.H.L= R.H.L= f(1)

$\lim_{x\to1}f(x)=\lim_{x\to1}f(x)=3(1)-1$

$\lim_{x\to1^-}(ax+7)=\lim_{x\to1^+}\frac{x+3}{b}=2$

$a+7=\frac{4}{b}=2$

36. The second order derivative of $\cos^{-1}(4x^3-3x)$ with respect to $\cos^{-1}(2x^2-1)$, where $\frac{1}{2}<x<1$ is

(1) 0 (2) $\frac{-1}{\sqrt{1-x^2}}$

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

Ans. (1)

Sol. $u=\cos^{-1}(4x^3-3x)$ $v=\cos^{-1}(2x^2-1)$

Put $x=\cos\theta \Rightarrow \theta=\cos^{-1}x$

$u=\cos^{-1}(4\cos^3\theta-3\cos\theta)$ $v=\cos^{-1}(2\cos^2\theta-1)$

$u=\cos^{-1}(\cos3\theta)$ $v=\cos^{-1}(\cos2\theta)$

$u=3\theta$ $v=2\theta$

Now $\frac{u}{v}=\frac{3\theta}{2\theta}=\frac{3}{2}$

$u=\frac{3}{2}v$

Differentiate u w.r.t v

$\frac{du}{d\upsilon}=\frac{3}{2}\Rightarrow\frac{d^2u}{dv^2}=0$

37. If $f(x)=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$, then $f'\left(\frac{1}{2}\right)=$

(1) $\frac{8}{5}$ (2) $\frac{5}{8}$

(3) $\frac{4}{5}$ (4) 0

Ans. (1)

Sol. $f(x)=\sin^{-1}\left(\frac{2x}{1+x^2}\right)$

Put $x=\tan\theta,\ \theta=\tan^{-1}x$

$f(x)=\sin^{-1}\left(\frac{2\tan\theta}{1+\tan^2\theta}\right)$

$\sin^{-1}(\sin2\theta)=2\theta$

$f(x)=2\tan^{-1}x$

$f'(x)=\frac{2}{1+x^2}$

$f'\left(\frac{1}{2}\right)=\frac{2}{1+\frac{1}{4}}=\frac{8}{5}$

38. If $\sqrt{x}\sqrt[3]{y}=(x+y)^n$ and $x\frac{dy}{dx}-y=0$, then n=

(1) 1

(2) $\frac{6}{5}$

(3) $\frac{5}{6}$

(4) $\frac{4}{9}$

Ans. (3)

Sol. Homogenous Function

$\frac{1}{2}+\frac{1}{3}=n$

$n=\frac{5}{6}$

39. In a Mahakumbh, a drone camera is moving along $3y=x^3-3$. When y–coordinate changes 9 times as fast as x– coordinate, it captures good quality pictures. Then one of the precise positions of the drone at that instant is

(1) (–3,–8)

(2) (3,–8)

(3) (3,8)

(4) (–3,8)

Ans. (3)

Sol. $3y=x^3-3$....(1)

Given, $\frac{dy}{dt}=9.\frac{dx}{dt}$

Differentiate w.r.t. 't'

$3\frac{dy}{dt}=3x^2\frac{dx}{dt}-0$

$3.9.\frac{dx}{dt}=3x^2\frac{dx}{dt} \Rightarrow x^2=9$

$x=\pm3$

Put $x=3$ in (1)

$3y=27-3=24$

$y=8$

$x=-3$

$3y=-27-3$

$3y=-30$

$y=-10 \Rightarrow (-3,-10) \quad \therefore (x,y)=(3,8)$

40. A Youtube short viedo is getting viral according to $f(t)=-2t^3+3t^2+5$. At what time does the video get maximum number of shares? ('t' is in hours)

(1) 1 (2) 2

(3) 3 (4) 4

Ans. (1)

Sol. $f(t)=-2t^3+3t^2+5$.............(1)

$f'(t)=-6t^2+6t$...........(2)

For max or min $f'(t)=0$

$-6t^2+6t=0 \Rightarrow -6t(t-1)=0$

$t=0, t=1$

41. $\int xf(x)dx+\frac{f(x)}{2}=0$, then f(x) is equal to

(1) e^{-2x} (2) e^{2x}

(3) e^{-x^2} (4) e^{x^2}

Sol. $xf(x)+\frac{f'(x)}{2}=0$

$2xf(x)+f'(x)=0$

Take y = f(x)

$\frac{dy}{dx}+2xy=0$

$\frac{dy}{dx}=-2xy$

$\frac{dy}{dx}=-2xdx$

$\int\frac{dy}{y}=-2\int xdx$

$\log y=-2\frac{x^2}{2}+\log C$

$\log y - \log C = -x^2$

$y=C.e^{-x^2}$

42. One of the possible functions f(x) which satisfies $\int_{-2}^{2} f(x)dx=0$ is

(1) $\log\left(\frac{2+x}{2-x}\right)$ (2) sin(2+x)

(3) $2x^3+2x+1$ (4) 2x tanx

Ans. (1)

Sol. $f(x)=\log\left(\frac{2+x}{2-x}\right)$

$f(-x)=\log\left(\frac{2-x}{2+x}\right)=-\log\left(\frac{2+x}{2-x}\right)=-f(x)$

$\therefore \int_{-a}^{a} f(x)dx=0$

43. $\int_{a-6}^{b-6} f(x+6)dx$ is equal to

(1) $\int_a^b f(x-6)dx$ (2) $\int_a^b f(x+6)dx$

(3) $\int_a^b f(x)dx$ (4) $\int_a^b f(-x)dx$

Ans. (3)

Sol. $I=\int_{a-6}^{b-6} f(x+6)dx$

Take t = x + 6

$I=\int_a^b f(t)dt = \int_a^b f(x)dx$

44. If 'n' is a natural number, then $\int\frac{\sin^n x}{\cos^{n+2} x}dx=$

(1) $\frac{\tan^{n-1} x}{n-1}+C$ (2) $\frac{\tan^n x}{n}+C$

(3) $\frac{\tan^{n+2} x}{n+2}+C$ (4) $\frac{\tan^{n+1} x}{n+1}+C$

Ans. (4)

Sol. $I=\int\frac{\sin^n x}{\cos^n}.\frac{1}{\cos^2 x}dx$

$=\int(\tan x)^n \sec^2 xdx$

$=\int t^n dt$

t = tan x

dt = $\sec^2$ x

$=\frac{t^{n+1}}{n+1}+C$

$=\frac{1}{n+1}(\tan x)^{n+1}+C$

45. $\int e^{-x\log 2}2^x dx=$

(1) logx + C (2) x + C

(3) $\frac{1}{x}+C$ (4) $\frac{x^2}{2}+C$

Ans. (2)

Sol. $I=\int e^{-x\log 2}\cdot 2^x dx$

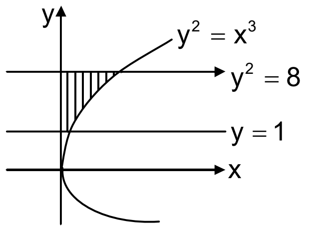
$=\int e^{-\log 2^x}\cdot 2^x dx$

$=\int 2^{-x}.\,2^x dx=\int 1\cdot dx = x+c$

46. The area of the region bounded by the curve $y^2 = x^3$, the y–axis and the lines y = 1 and y = 8 is
(1) $\frac{155}{3}$ sq. units
(2) $\frac{93}{5}$ sq. units
(3) 93 sq. units
(4) 155 sq. units

Ans. (2)

Sol. $y^2 = x^3$, y = 1 and y = 8



$$A = \int_1^8 y^{2/3}dy = \frac{3}{5}y^{5/3}\Big]_1^8 \quad = \frac{3}{5}\left(8^{5/3} - 1^{5/3}\right)$$

$$\frac{3}{5}(31) = \frac{93}{5}$$

47. The area enclosed by the curve $x = \sqrt{3}\cos\theta$, $y = \sqrt{3}\sin\theta$
(1) $\sqrt{3}\pi$ sq. units
(2) 9π sq. units
(3) 6π sq. units
(4) 3π sq. units

Ans. (4)

Sol. $x = \sqrt{3}\cos\theta$, $y = \sqrt{3}\sin\theta$

$x^2 + y^2 = 3$

Area of circle = πr^2 = 3π

48. Sum of the squares of the order and degree (if defined) of a differential equation $2y' + (y'')^2 = \sqrt{y''-3}$ is
(1) 3 (2) 20
(3) 8 (4) 16

Ans. (2)

Sol. $2y' + (y'')^2 = \sqrt{y''-3}$

$(2y' + (y'')^2)^2 = y'' - 3$

Order = 2 = m

Degree = 4 = n

$m^2 + n^2 = 2^2 + 4^2 = 20$

49. If A= {a, b, c, d, e, f}, then the number of subsets of A which contains at least 2 elements is
(1) 64 (2) 65
(3) 57 (4) 59

Ans. (3)

Sol. A = {a, b, c, d, e, f}

${}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6$

15 + 20 + 15 + 6 + 1= 57

50. If A = {1, 2, 3, 4, …. 10}, then the number of non empty subsets of A containing only even number is
(1) 31 (2) 32
(3) 30 (4) 29

Ans. (1)

Sol. A = {1, 2, 3, ………, 10}

No of non empty subsets

$= 2^5 - 1 = 31$

51. The domain of the function $\sqrt{\frac{x-7}{9-x}}$ is
(1) (7, 9) (2) [7, 9)
(3) [7, 9] (4) (7, 9]

Ans. (2)

Sol. $\frac{x-7}{9-x} \ge 0$

$(x - 7)(9 - x) \ge 0$, $9 - x \ne 0 \Rightarrow x \ne 9$

$(x - 7)(x - 9) \le 0$

$x \in [7,9)$

52. If n(A) = 2 and the number of relations from set A to set B is 1024, then n(B) is
(1) 2
(2) 5
(3) 2^5
(4) 5^2

Ans. (2)

Sol. n(A) = 2 n(B) = ?

Number of relation = 1024

$2^{n(A) \times n(B)} = 1024$

$2^{2 \times n(B)} = 2^{10}$

2 (n (B)) = 10

n (B) = 5

53. Probability of at least one of events A and B occur is 0.6. If A and B occurs simultaneously with probability 0.2, then $P(\bar{A}) + P(\bar{B})$ is
(1) 1 (2) 0.8
(3) 0.6 (4) 1.2

Ans. (4)

Sol. $P(A \cup B) = 0.6$ $P(A \cap B) = 0.2$

$P(\bar{A}) + P(\bar{B}) = 1 - p(A) + 1 - P(B)$

= 2 – (P(A) + P(B))

$= 2 - [P(A \cup B) + P(A \cap B)]$

= 2 – 0.8

= 1.2

54. The maximum value of sin $(x + \pi/6)$ + cos $(x + \pi/6)$ is attained at x =
(1) $\pi/2$ (2) $\pi/4$
(3) $\pi/6$ (4) $\pi/12$

Ans. (4)

Sol. $\sin\left(x - \frac{\pi}{6}\right) + \cos\left(x + \frac{\pi}{6}\right)$

$= \sqrt{2}\sin\left(x+\frac{\pi}{6}+\frac{\pi}{4}\right)$

$f(x) = \sqrt{2}\sin\left(x+\frac{5\pi}{12}\right)$

For max of $f(x) \Rightarrow x+\frac{5\pi}{12} = \frac{\pi}{2}$

$x = \frac{\pi}{2}-\frac{5\pi}{12}$

$x = \frac{\pi}{12}$

55. The angles of a triangle are in A.P and the greatest angle is double the lest angle, then sine of the third angle is

(1) $\frac{\sqrt{3}}{2}$ (2) $\frac{1}{\sqrt{2}}$

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

Ans. (1)

Sol. a – d + a + a + d = 180

a = 60°

$\sin 60° = \frac{\sqrt{3}}{2}$

56. The mean and standard deviation of 100 items are 50 and 4, respectively then the sum of all squares of the items is

(1) 250000 (2) 251600

(3) 256100 (4) 265100

Ans. (2)

Sol. n = 100, $\bar{X}$ =50, $\sigma = 4$

$\Rightarrow \sigma = \sqrt{\frac{\sum x_i^2}{n}-(\bar{X})^2}$

$\Rightarrow 16 = \frac{\sum x_i^2}{100}-2,500$

$\Rightarrow 251600 = \sum x_i^2$

57. Probability of occurrence of an event A is 1/2 and that of B is 3/10. If A and B are mutually exclusive, then the probability of occurrence of neither A nor B is

(1) $\frac{4}{5}$ (2) $\frac{3}{5}$

(3) $\frac{2}{5}$ (4) $\frac{1}{5}$

Ans. (4)

Sol. $P(A) = \frac{1}{2}, P(B) = \frac{3}{10}$

$P(A\cap B) = \phi$

$P(\overline{A\cup B}) = 1-P(A\cup B)$

$= 1-\left[\frac{1}{2}+\frac{3}{10}\right]$

$= 1-\frac{8}{10}$

$= \frac{1}{5}$

58. Let R be the relation in the set N given by R = {(a, b) : a = b – 2, b > 6}. Which of the following is the correct answer?

(1) $(2,4)\in R$ (2) $(3,8)\in R$

(3) $(6,8)\in R$ (4) $(8,7)\in R$

Ans. (3)

Sol. R = {(a, b) : a = b – 2, b > 6}

Check condition

b = 8 ⇒ a = 8 – 2 = 6

b = 7 ⇒ a = 7 – 2 = 5

$(6,8)\in R$

59. $f(x) = (x + 1)^2$ for x ≥ 1, g(x) is a function whose graph is the reflection of the graph of f(x) in the line y = x, then g(x) is

(1) $-\sqrt{x}-1$ (2) $\sqrt{x}+1$

(3) $\sqrt{x}-1$ (4) $\sqrt{x-1}$

Ans. (3)

Sol. $f(x) = (x + 1)^2$

Let y = f(x)

$y = (x + 1)^2$

$x+1 = \sqrt{y}$

$x = \sqrt{y}-1$

$f^{-1}(y) = \sqrt{y}-1$

$g(x) = f^{-1}(x) = \sqrt{x}-1$

60. If $\sin^{-1} x + \sin^{-1} y = \pi/2$, then x^2 is equal to

(1) $1 - y^2$ (2) $1 + y^2$

(3) $\sqrt{1-y^2}$ (4) $\sqrt{1+y^2}$

Ans. (1)

Sol. $\sin^{-1}x+\sin^{-1}y = \frac{\pi}{2}$

$\sin^{-1}x = \frac{\pi}{2}-\sin^{-1}y$

$\sin^{-1}x = \cos^{-1}y$

$\sin^{-1}x = \sin^{-1}\sqrt{1-y^2}$

$x = \sqrt{1-y^2}$

$x^2 = 1-y^2$