INDIAN SCHOOL AL WADI AL KABIR

Class XII, Mathematics

SAMPLE PAPER No. 2, M.C.Q, Case Study, 30-08-2021

1) Let A = {1, 2, 3, 4}. Let R be the equivalence relation on A × A defined by (a, b) R (c, d) if a + d = b + c. Then the equivalence class [(1, 3)] is

(a) {(1, 3)} ***(b)*** {(2, 4)} ***(c)*** {(1, 8), (2, 4), (1, 4)} ***(d)*** {(1, 3) (2, 4)}

2) Given set A = {-1, 0, 1} and a relation R = {(-1, 0), (0, -1)}, the relation R will be

(a) reflexive if (1, 1) is added (b) symmetric if (0, 1) is added
(c) transitive if (-1, -1) is added (d) symmetric if (1, 0) is added

3) A relation R in S= {4, 2, 3} is defined as R= {(4, 4), (4, 2), (2, 2), (3, 3)}. Find the element of the relation R to be removed to make it as an equivalence relation.

(a) (4, 2) (b) (2, 2) (c) (4, 4) (d) (3, 3)

4) If a function f: A x B → B x A is defined by f (a, b) = (b, a) on two sets A and B, then the function is

(a) Many-one (b) One-one but not onto

(c) One-one and onto (d) Neither one-one nor onto

5) Let f: [2, ∞) → R be the function defined by f(x) = x^2 – 4x + 5, then the range of f is

(a) R (b) [2, ∞) (c) [1, ∞) (d) [-2, ∞)

6) The maximum number of equivalence relations on the set A = {2, 3, 4} are

(a) 1 (b) 27 (c) 3 (d) 5

7) If a relation R on the set {1, 2, 3} be defined by R = {(1, 2)}, then R is

(a) reflexive (b) transitive (c) symmetric (d) none of these

8) Which of the following functions form Z into Z is bijective?

(a) f (x) = x^3 (b) f (x) = x + 2 (c) f (x) = 2x + 1 (d) f (x) = x^2 + 1

9)Sin [2 $\cot^{-1}\left(\frac{-5}{12}\right)$ is equal to

(a) $\left(\frac{-120}{169}\right)$ (b) $\left(\frac{-5}{169}\right)$ (c) $\left(\frac{120}{169}\right)$ (d) $\left(\frac{5}{12}\right)$

10) If Sin ($\tan^{-1}x + \cot^{-1}\sqrt{2}$) = 1, then value of x is

(a) $-\sqrt{2}$ (b) $\sqrt{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{-1}{\sqrt{2}}$

11) $\tan^{-1}\left[2\cos\left(2\sin^{-1}\frac{1}{2}\right)\right]$ is equal to

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) π

12) If $\tan^{-1}x + \tan^{-1}y = \frac{4\pi}{5}$, then $\cot^{-1}x + \cot^{-1}y$ equals

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{5}$

13) The maximum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$ *is*

(a) $\frac{\pi}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) π

14) if $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ = 8, then the value of x is

(a) -2 (b) 2 (c) 3 (d) 5

15) In the interval $\frac{\pi}{2} < x < \pi$, the value of 'x' for which the matrix $\begin{bmatrix} 2\sin x & 3 \\ 1 & 2\sin x \end{bmatrix}$ is

Singular

(a) $\frac{\pi}{6}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{5}$

16) A = $\begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, then the value of x satisfying $0 < x < \frac{\pi}{2}$ when $A + A^T = \sqrt{2}\, I_2$ is

(a) $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{5}$

17) If A is a square matrix of order 3 such that $|adj\ A| = 64$, then $|A|$ is

(a) -8 (b) 6 (c) 8 (d) ∓ 8

18) If A = $\begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric, then the value of a is

(a) $\frac{-2}{3}$ (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

19) The inverse of the matrix A = $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ is

(a) $\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -5 \\ 1 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 5 \\ -1 & 2 \end{bmatrix}$

20) For the following system of equations,

2x + 8y + 5z = 5 ; x + y + z = -2 and x + 2y – z = 2, the value of Z is

(a) -3 (b) 2 (c) -1 (d) 1

21) The value of the constant k so that the function defined below is continuous at x =0, where

F(x) = $\begin{cases} \frac{1-cos4x}{8x^2}, & x \neq 0 \\ k, & x = 0 \end{cases}$ is

(a) 8 (b) 4 (c) -1 (d) 1

22) The function where f(x) = [x] denotes the greatest integer function, is continuous at

(a) 8 (b) 4.5 (c) -1 (d) 1

23) The number of points at which the function f(x) = $\frac{1}{x - [x]}$ is not continuous is

(a) 1 (b) 0 (c) 2 (d) none of these

24) The set of points where the functions f given by f(x) = $|x - 3|cosx$ differentiable is

(a) R (b) R -{3} (c) (0, ∞) (d) none of these

25) If f(x) = $\begin{cases} ax + 1, & if\ x \geq 1 \\ x + 2, & if\ x < 1 \end{cases}$ is continuous, then ‘a’ should be equal to

(a) 2 (b) -2 (c) 1 (d) -1

26) The number of points at which the function f(x) = $\frac{1}{log\ |x|}$ is discontinuous is

(a) 0 (b) 2 (c) 3 (d) 1

27) If y = tan (x +y), then dy/dx is equal to

(a) -Cosec^2(x + y) (b) Cosec^2(x + y) (c) -Cosec(x + y) (d) Cosec(x + y)

28) If x = a sec^{3}x and y = a tan^{3}x, then dy/dx at x = $\frac{\pi}{3}$ is

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

29) If f(x) = $|cos\ x|$, then f ′ $\left(\frac{3\pi}{4}\right)$ is

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

30) If y = $\sec^{-1}\left(\frac{\sqrt{x}+1}{\sqrt{x}-1}\right) + \sin^{-1}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right)$, then $\frac{dy}{dx}$ is equal to

(a) 1 (b) $\frac{\sqrt{x}+1}{\sqrt{x}-1}$ (c) $\frac{\sqrt{x}-1}{\sqrt{x}+1}$ (d) 0

31) The derivative of sin x w.r.t. cos x is

(a) tan x (b) cot x (c) – cot x (d) tan x

32) If y = $\sqrt{sinx + \sqrt{sin\,x + \sqrt{sin\,x + \ldots\ldots\ldots\infty}}}$, then (2y – 1) is equal to

(a) sin x (b) cos x (c) – cos x (d) sin x

33) Find an angle θ,0 < θ < $\frac{\pi}{2}$, which increases twice as fast as its sine.

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

34) The slope of the normal to the curve x = a $\cos^3 \emptyset$, y = a $\sin^3 \emptyset$ at $\emptyset = \frac{\pi}{4}$ is

(a) 0 (b) 2 (c) 3 (d) 1

35) Find the least value of 'a' such that the function f given by f(x) = x^2 + ax + 1 is strictly increasing on [1,2].

(a) -2 (b) 2 (c) 1 (d) -1

36) The sides of an equilateral triangle are increasing at the rate of 2cm/sec. The rate at which the area increases, when side is 10 cm is

(a) 10 cm²/s (b) √3 cm²/s (c) 10√3 cm²/s (d) 103 cm²/s

37) The equation of normal to the curve $3x^2 - y^2 = 8$ which is parallel to the line ,x + 3y = 8 is

(a) 3x – y = 8 (b) 3x + y + 8 = 0 (c) x + 3y ± 8 = 0 (d) x + 3y = 0

38) If the curve ay + x^2 = 7 and x^3 = y, cut orthogonally at (1, 1) then the value of a is

(a) 1 (b) 0 (c) -6 (d) 6

39) The equation of the tangent to the curve y (1 + x^2) = 2 – x, where it crosses x-axis is

(a) x + 5y = 2 (b) x – 5y = 2 (c) 5x – y = 2 (d) 5x + y = 2

40) The interval on which the function f (x) = $2x^3 + 9x^2 + 12x - 1$ is decreasing is

(a) (-1, ∞) (b) (-2, -1) (c) (-∞, -2) (d) (-1, 1)

CASE STUDY QUESTION

Two schools A and B want to award their selected students on the values of Honesty, Hard work, and Punctuality. The school A wants to award Rs. x each, Rs. y each and Rs. z each for the three respective values to its 3, 2 and 1 students respectively with a total award money of Rs.2200. School B wants to spend Rs. 3100 to award its 4,1 and 3 students on the respective values (by giving the same award money to the three values as school A). If the total amount of award for one prize on each value is Rs. 1200. Using the concept of matrix and determinants answer the following questions.

41) What is the award money for Honesty?

(a) ₹ 350 (b) ₹ 300 (c) ₹ 500 (d) ₹ 400

42) What is the award money for Punctuality?

(a) ₹ 300 (b) ₹ 280 (c) ₹ 450 (d) ₹ 500

43) What is the award money for Hard work?

(a) ₹ 500 (b) ₹ 400 (c) ₹ 300 (d) ₹ 550

44) If a matrix P is both symmetric and skew symmetric then $|P|$ is equal to

(a) 0 (b) -1 (c) 3 (d) 1

45) If P and Q are two matrix such that PQ = Q and QP = P, then $|Q^2|$ is equal to

(a) $|Q|$ (b) $|P|$ (c) 1 (d) 0

Amit visited the Exhibition along with his family. The Exhibition had a huge swing, which attracted many children. He found that the swing traced the path of a Parabola as given by $y = x^2$.

Answer the following questions using the above information:

46) Let $f : R \rightarrow R$, be defined by $f(x) = x^2$ is

(a) Neither Surjective nor Injective (b) Surjective

(c) Injective (d) Bijective

47) Let $f : N \rightarrow N$ be defined by $f(x) = x^2$ is

(a) Neither Surjective nor Injective (b) Surjective

(c) Injective (d) Bijective

48) Let f: {1, 2, 3, ...} →{1, 4, 9, ...} be defined by $f(x) = x^2$ is

(a) Neither Surjective nor Injective (b) Surjective

(c) Injective (d) Bijective

49) Let $f: N \rightarrow R$ be defined by $f(x) = x^2$. Range of the function among the following is

(a) {1, 4, 9, 16, ...} (b) {1, 4, 8, 9, 10,...}

(c) {1, 4, 9, 15, 16,...} (d) {1, 4, 8, 16,...}

50) The function $f: Z \rightarrow Z$ defined by $f(x) = x^2$ is

(a) Neither Surjective nor Injective (b) Surjective

(c) Injective (d) Bijective

Answers

1) ***(d)*** {(1, 3) (2, 4)} 2) Ans (c) transitive if (-1, -1) is added 3) (a) (4, 2)

4) (c) One-one and onto 5) (c) [1, ∞) 6) (d) 5 7) (b) transitive

8) (b) f (x) = x + 2 9) (a) $(\frac{-120}{169})$ 10) (b) √2 11) (b) $\frac{\pi}{4}$

12) (d) $\frac{\pi}{5}$ 13) (c) $\frac{1}{2}$ 14) (a) -2 15) (b) $\frac{2\pi}{3}$

16 (b) $\frac{\pi}{4}$ 17) (d) ∓ 8 18) (a) $\frac{-2}{3}$ 19(c) $\begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$

20) (c) -1 21) (d) 1 22) (b) 4.5 23 (d) none of these

24 (b) R -{3} 25 (a) 2 26 (c) 3 27) (a) $-Cosec^2(x + y)$

28) (b) $\frac{\sqrt{3}}{2}$ 29)(a) $\frac{1}{\sqrt{2}}$ 30) (d) 0 31) (c) – cot x

32) (b) cos x 33) (c) $\frac{\pi}{3}$ 34) (d) 1 35) (a) -2

36) (c) $10\sqrt{3}$ cm²/s 37) (c) x + 3y ± 8 = 0 38) (d) 6 39) (a) x + 5y = 2

40) (b) (-2, -1) 41) (b) ₹ 300 42) (d) ₹ 500 43) (b) ₹ 400

44) (a) 0 45) (a) $|Q|$ 46) (a) Neither Surjective nor Injective

47) (c) Injective 48) (d) Bijective 49)(a) {1, 4, 9, 16, ...}

50) (a) Neither Surjective nor Injective