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Questions:

Multiple Choice Question

1. The number of constant functions from a set containing m elements to a set containing n elements is
(a) mn (b) m (c) n (d) m+n

2. The function f:[0,2π]→[-1,1] defined by f(x) = sin x is
(a) one-to-one (b) on to (c) bijection (d) cannot be defined

3. If the function f:[-3,3]→S defined by f(x) = x^2 is onto, then S is
(a) [-9,9] (b) R (c) [-3,3] (d) [0,9]

4. Let X = {1, 2, 3, 4}, Y = {a, b, c, d} and f = {(1, a), (4, b), (2, c), (3, d), (2, d)}. Then f is
(a) an one-to-one function (b) an onto function (c) a function which is not one-to-one (d) not a function

5. The inverse of f(x) = $\begin{cases} x & if \quad x<1 \\ x^2 & if \quad 1\le x\le 4 \\ 8\sqrt{x} & if \quad x>4 \end{cases}$ is
(a) $f^{-1}(x)=\begin{cases} x & if \quad x<1 \\ \sqrt{x} & if \quad 1\le x\le 16 \\ \frac{x^2}{64} & if \quad x>16 \end{cases}$ (b) $f^{-1}(x)=\begin{cases} -x & if \quad x<1 \\ \sqrt{x} & if \quad 1\le x\le 16 \\ \frac{x^2}{64} & if \quad x>16 \end{cases}$ (c) $f^{-1}(x)=\begin{cases} x^2 & if \quad x<1 \\ \sqrt{x} & if \quad 1\le x\le 16 \\ \frac{x^2}{64} & if \quad x>16 \end{cases}$ (d) $f^{-1}(x)=\begin{cases} 2x & if \quad x<1 \\ \sqrt{x} & if \quad 1\le x\le 16 \\ \frac{x^2}{8} & if \quad x>16 \end{cases}$

6. Let f:R→R be defined by f(x) = 1 - |x|. Then the range of f is
(a) R (b) $(1,\infty)$ (c) $(-1,\infty)$ (d) $(-\infty,1]$

7. The function f:R→R be defined by f(x) = sinx + cosx is
(a) an odd function (b) neither an odd function nor an even function (c) an even function (d) both odd function and even function

8. The function f:R→R is defined by f(x)=$\frac{(x^2+cosx)(1+x^4)}{(x-sinx)(2x-x^3)}+e^{-|x|}$ is
(a) an odd function (b) neither an odd function nor an even function (c) an even function (d) both odd function and even function.

9. If A = {(x,y) : y = e^x, x∈R} and B = {(x,y) : y = e^{-x}, x ∈ R} then n(A∩B) is
(a) Infinity (b) 0 (c) 1 (d) 2

10. If A = {(x,y) : y = sin x, x ∈ R} and B = {(x,y) : y = cos x, x ∈ R} then A∩B contains
(a) no element (b) infinitely many elements (c) only one element (d) cannot be determined

11. The relation R defined on a set A= {0,-1, 1, 2} by xRy if $|x^2+y^2| \le 2$, then which one of the following is true?
(a) R = {(0,0), (0,-1), (0, 1), (-1, 0), (-1, 1), (1, 2), (1, 0)} (b) R^{-1} = {(0,0), (0,-1), (0, 1), (-1, 0), (1, 0)} (c) Domain of R is {0,-1, 1, 2} (d) Range of R is {0,-1, 1}

12. If f(x) = |x - 2| + |x + 2|, x ∈ R, then
(a) $f(x)=\begin{cases} -2x & \text{if} \quad x\in(-\infty,-2] \\ 4 & \text{if} \quad x\in(-2,2] \\ 2x & \text{if} \quad x\in(2,\infty) \end{cases}$ (b) $f(x)=\begin{cases} 2x\ if\ x\in(-\infty,-2] \\ 4x\ if\ x\in(-2,2] \\ -2x\ if\ x\in(2,\infty) \end{cases}$ (c) $f(x)=\begin{cases} -2x\ if\ x\in(-\infty,-2] \\ -4x\ if\ x\in(-2,2] \\ 2x\ if\ x\in(2,\infty) \end{cases}$ (d) $f(x)=\begin{cases} -2x\ if\ x\in(-\infty,-2] \\ 2x\ if\ x\in(-2,2] \\ 2x\ if\ x\in(2,\infty) \end{cases}$

13. Let R be the set of all real numbers. Consider the following subsets of the plane R x R: S = {(x, y) : y =x + 1 and 0 < x < 2} and T = {(x,y) : x - y is an integer} Then which of the following is true?
(a) T is an equivalence relation but S is not an equivalence relation (b) Neither S nor T is an equivalence relation (c) Both S and T are equivalence relation
(d) S is an equivalence relation but T is not an equivalence relation.

14. Let A and B be subsets of the universal set N, the set of natural numbers. Then $A'\cup[(A\cap B)\cup B']$ is
(a) A (b) A′ (c) B (d) N

15. The number of students who take both the subjects Mathematics and Chemistry is 70. This represents 10% of the enrollment in Mathematics and 14% of the enrollment in Chemistry. The number of students take at least one of these two subjects, is
(a) 1120 (b) 1130 (c) 1100 (d) insufficient data

16. If n((A × B) ∩(A × C)) = 8 and n(B ∩ C) = 2, then n(A) is
(a) 6 (b) 4 (c) 8 (d) 16

17. If n(A) = 2 and n(B ∪ C) = 3, then n[(A × B) ∪ (A × C)] is
(a) 2^3 (b) 3^2 (c) 6 (d) 5

18. If two sets A and B have 17 elements in common, then the number of elements common to the set A ×B and B ×A is
(a) 2^{17} (b) 17^2 (c) 34 (d) insufficient data

19. For non-empty sets A and B, if A ⊂ B then (A ×B) ∩ (B ×A) is equal to
(a) A ∩ B (b) A ×A (c) B ×B (d) none of these.

20. The number of relations on a set containing 3 elements is
(a) 9 (b) 81 (c) 512 (d) 1024

21. Let R be the universal relation on a set X with more than one element. Then R is
(a) not reflexive (b) not symmetric (c) transitive (d) none of the above

22. Let X = {1, 2, 3, 4} and R = {(1, 1), (1, 2), (1, 3), (2, 2), (3, 3), (2, 1), (3, 1), (1, 4),(4, 1)}. Then R is
(a) reflexive (b) symmetric (c) transitive (d) equivalence

23. The range of the function $\frac{1}{1-2sinx}$ is
(a) $(-\infty,-1)\cup(\frac{1}{3},\infty)$ (b) $(-1,\frac{1}{3})$ (c) $[-1,\frac{1}{3}]$ (d) $(-\infty,-1]\cup[\frac{1}{3},\infty)$

24. The range of the function $f(x)=|\lfloor x\rfloor - x|, x\in R$ is
(a) [0, 1] (b) $[0,\infty)$ (c) [0, 1) (d) (0, 1)

25. The rule f(x) = x^2 is a bijection if the domain and the co-domain are given by
(a) R, R (b) R, $(0,\infty)$ (c) $(0,\infty)$, R (d) $[0,\infty)$, $[0,\infty)$