

Assignment-1

- (1) If W denotes the set of all constant functions on the set of real numbers \mathbb{R} and $|S|$ denotes the cardinality of any set S , then
- (a) $|W| = |\mathbb{R}|$
 - (b) $|W| = |\mathbb{N}|$, where \mathbb{N} denotes the set of natural numbers
 - (c) $|W| = 0$
 - (d) None of the above
- (2) Which of the following is a metric on \mathbb{R} ?
- (a) $d(x, y) = \min(x, y)$
 - (b) $d(x, y) = |x - y|$
 - (c) $d(x, y) = |x^2 - y^2|$
 - (d) none of these
- (3) In the metric space (\mathbb{R}, d) , where d is usual metric on the set of real numbers \mathbb{R} , if $A =]0, 1]$, then
- (a) Closure of the set A , $\bar{A} =]0, 1]$
 - (b) Interior of the set A , $\text{int}(A) =]0, 1]$
 - (c) Interior of the set A , $\text{int}(A) =]0, 1[$
 - (d) Derived set of the set A , $A' =]0, 1]$
- (4) If A is any subset of a metric space X , then
- (a) A is open iff A contains all of its limit points
 - (b) A is open iff A is a neighbourhood of all of its points
 - (c) A is closed iff $\text{int}(A) = A$
 - (d) The diameter of A is less than the diameter of its derived set A'
- (5) Every infinite set has a
- (a) countable subset
 - (b) uncountable subset
 - (c) countable and uncountable subset
 - (d) none of these
- (6) Which of the following statement is true?
- (a) Union of finite no. of convex sets is convex
 - (b) Union of any no. of convex sets is convex
 - (c) Intersection of finite no. of convex sets is convex
 - (d) None of these
- (7) Which of the following set is uncountable?
- (a) Set of rational numbers \mathbb{Q}
 - (b) $A = \left\{ \frac{1}{n} : n \in \mathbb{Z} \right\}$, \mathbb{Z} is the set of integers
 - (c) $S = \{(0, n) : n \in \mathbb{N}\}$, where \mathbb{N} denotes the set of natural numbers
 - (d) The power set of natural numbers $P(\mathbb{N})$

- (8) Which of the following pair is a metric space?
- (a) (\mathbb{Z}, d) , where \mathbb{Z} denotes the set of integers and $d(x, y) = \max(x - y, 0) \forall x, y \in \mathbb{Z}$
- (b) (X, d') , where $d'(x, y) = \begin{cases} 1, & \text{if } x \neq y \\ 0, & \text{if } x = y \end{cases} \forall x, y \in X$
- (c) (\mathbb{Z}, d_p) , where \mathbb{Z} denotes the set of integers and $d_p(x, y) = |x + y| \forall x, y \in \mathbb{Z}$
- (d) none of these
- (9) Which of the following subset of \mathbb{R}^2 is convex?
- (a) $A = \{(x, y): |x| \leq 5, |y| \leq 10\} \setminus B$, where $B = \{z \in \mathbb{R}^2: z = tx_1 + (1 - t)x_2, 0 \leq t \leq 1, x_1 = (5, 3) \text{ and } x_2 = (5, -3)\}$
- (b) $C = \{(x, y): |x| + |y| \leq 3\}$
- (c) $D = \{(x, y): y = \sin x\}$
- (d) none of these
- (10) Which of the following subset of \mathbb{R}^2 is open?
- (a) $X = D_{(0,0)}(1) \cup D_{(1,0)}(1) \cup D_{(0,1)}(1)$, where $D_{(a,b)}(r) = \{(x, y): (x - a)^2 + (y - b)^2 < r\}$
- (b) $Y = \{(x, y): y = x^3\}$
- (c) $Z \setminus V$, where $Z = \{(x, y): x^2 + y^2 < 2\}$ and $V = \{(x, y): x^2 + y^2 < 1\}$
- (d) none of these

Answer sheet for assignment-1

1. (a)
2. (b)
3. (c)
4. (b)
5. (a)
6. (c)
7. (d)
8. (b)
9. (b)
10. (a)