

XII - Mathematics Assignment - Relations and Functions.

Q1. Let \mathbb{Z} be the set of all integers and R be a relation on \mathbb{Z} defined as $R = \{(a, b) : a, b \in \mathbb{Z}\}$ also $(a-b)$ is divisible by 5. Prove that R is an equivalence relation.

Q2. Let \mathbb{Q} be the set of all rational numbers and R be the relation on \mathbb{Q} defined by $R = \{(x, y) : |x-y| > 0\}$. Prove that R is reflexive and symmetric but not transitive.

Q3. Let $A = \{4, 5, 6\}$. Give an example of a relation on A which is

- (a) reflexive and symmetric but not transitive.
- (b) reflexive and transitive but not symmetric
- (c) symmetric and transitive but not reflexive.

Q4. Show that the relation R defined by $(a, b) R (c, d) \Rightarrow a+d = b+c$ on the set $\mathbb{N} \times \mathbb{N}$ is an equivalence relation.

Q5. Let $f : A \rightarrow B$ be a function. Define a relation R in A given by $R = \{(a, b) : f(a) = f(b)\}$ Is R an equivalence relation?

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26. Prove that the relation R in the set $A = \{1, 2, 3, 4, 5\}$ given by $R = \{(a, b) : |a-b| \text{ is even}\}$ is an equivalence relation.
27. Show that the relation R in the set A ,
 $A = \{x : x \in \mathbb{N}, 0 \leq x \leq 12\}$ given by
 $R = \{(a, b) : |a-b| \text{ is a multiple of } 4\}$ is an equivalence relation. Also find the set of all elements related to 2.
28. Show that the relation S' in the set A ,
 $A = \{x \in \mathbb{Z} : 0 \leq x \leq 12\}$ given by
 $S' = \{(a, b) : a, b \in A, |a-b| \text{ is divisible by } 4\}$ is an equivalence relation. Find the set of elements related to 1.
29. Show that the relation R on the set I of all integers defined by $R = \{(a, b) : (a-b) \text{ is divisible by } 3, a, b \in I\}$ is an equivalence relation.
30. State the reason for the relation R in the set $\{1, 2, 3\}$ given by $R = \{(1, 2), (2, 1)\}$ not to be transitive
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