

1. (a) State the definition of a relation from A to B .

(b) Give an example of a relation from $\{1, 2, 3, 4\}$ to $\{1, 2, 3, 4\}$ which is not reflexive or symmetric, but is transitive.

2. Which of the following are partitions of $S = \{a, b, c, d, e\}$? Mark all which are.

$\{\{a, b\}, \{c, d, e\}\}$

$\{\{a\}, \{c\}\}$

$\{a, b, c, d, e\}$

$\{a, b, c, d\}, \{e\}$

$\{\{a, b, c, d\}, \{e\}\}$

3. Express the definition of a surjective function in terms of ordered pairs.

4. Let S be a set and Π a partition of S defined by $a \sim b \Leftrightarrow \exists P \in \Pi$ for which $a, b \in P$.
Then \sim is a reflexive relation.

5. (a) State the definition of a graph.

(b) Suppose G is a graph with every vertex having degree at least 1. Create a relation \sim on the vertices of G by saying that two vertices v_1, v_2 of G are related iff there exists a walk from v_1 to v_2 which has no edge used more than once. Is \sim reflexive? Symmetric? Transitive?