

Math 301 - Worksheet on Properties of Relations

For each of the following relations, determine if the relation satisfies each of the 5 properties. If it does not satisfy a property, provide a counterexample that shows this.

1. $A = \{2, 4, 6, 8\}, R = \{(2, 2), (2, 4), (4, 2), (4, 4), (6, 6), (8, 8)\}$

Reflexive, Symmetric, Transitive

2. $A = \{2, 4, 6, 8\}, R = \{(2, 2), (4, 2), (4, 4), (6, 6), (8, 8)\}$

Reflexive, Antisymmetric, Transitive

3. $A = \{2, 4, 6, 8\}, R = \{(2, 2), (2, 4), (4, 2), (4, 4), (6, 8), (8, 6)\}$

Symmetric

4. $A = \{2, 4, 6, 8\}, R = \{(2, 4), (4, 2), (6, 8), (8, 6)\}$

Irreflexive, Symmetric

5. $A = \mathbb{Z}, R = \{(x, y) : x \leq y\}$ (This can be written as “ R is \leq ”.)

Reflexive, Antisymmetric, Transitive

6. $A = \mathbb{Z}, R = \{(x, y) : x < y\}$ (That is, “ R is $<$ ”.)

Irreflexive, Antisymmetric, Transitive

7. $A = \mathbb{Z}, R = \{(x, y) : x = y + 2\}$ (Or, “ R is the plus-two relation”.)

Irreflexive, Antisymmetric