

Relations

R_1 is a relation on \mathbb{Z}
 defined by
 $\{(a, b) \mid a + b \leq 3\}$

R_2 is a relation from $A = \{1, 2, 3, 4\}$
 to $B = \{1, 2, 3\}$ defined by
 $\{(a, b) \mid \gcd(a, b) = 1\}$

R_3 is a relation on \mathbb{Z}
 defined by
 $\{(a, b) \mid x = y^2\}$

R_4 is a relation on \mathbb{R}
 defined by
 $\{(a, b) \mid a \cdot b \geq 0\}$

- For each of the relations R_i defined above, list five ordered pairs that are in the relation.

R_1 :

R_2 :

R_3 :

R_4 :

- For each of the relations R_i above, determine if R_i has the properties listed (if applicable). If the relation does not have the indicated property, identify an ordered pair (or set of ordered pairs) that exhibits the failure.

	R_1	R_2	R_3	R_4
reflexive				
symmetric				
antisymmetric				
transitive				

3. Find an example of a relation on a set that is both symmetric and antisymmetric.

4. Let R be the relation on the set $\{1, 2, 3, 4, 5\}$ containing the ordered pairs:
 $(1, 1)$, $(1, 2)$, $(1, 3)$, $(2, 3)$, $(2, 4)$, $(3, 1)$, $(3, 4)$, $(3, 5)$, $(4, 2)$, $(4, 5)$, $(5, 1)$, $(5, 2)$, and
 $(5, 4)$.

(a) Find $R \circ R$

(b) Find R^2

(c) Find R^3