
Section 9.1

9.4 For the given subset A_i of $\mathbb{R}$ and the relation R_i $(1 \leq i \leq 3)$ from A_i to $\mathbb{R}$, determine whether R_i is a function from A_i to $\mathbb{R}$.

(a) $A_1 = \mathbb{R}$, $R_1 = \{(x, y) : x \in A_1, y = 4x - 3\}$

(b) $A_2 = [0, \infty)$, $R_2 = \{(x, y) : x \in A_2, (y + 2)^2 = x\}$

(a) $A_3 = \mathbb{R}$, $R_3 = \{(x, y) : x \in A_3, (x + y)^2 = 4\}$

9.8 Let $A = \{5, 6\}$, $B = \{5, 7, 8\}$ and $S = \{n : n \geq 3 \text{ is an odd integer}\}$. A relation from $A \times B$ to S is defined as $(a, b)Rs$ if $s \mid (a + b)$. Is R a function from $A \times B$ to S?

9.10 A function $g : \mathbb{Q} \to \mathbb{Q}$ is defined by $g(r) = 4r + 1$, $\forall r \in \mathbb{Q}$.

(a) Determine $g(\mathbb{Z})$ and $g(E)$, where E is the set of even integers.

(b) Determine $g^{-1}(\mathbb{N})$ and $g^{-1}(D)$, where D is the set of odd integers.

9.12 For a function $f : A \to B$ and subsets C and D of A and E and F of B, prove the following.

(a) $f(C \cup D) = f(C) \cup f(D)$

(b) $f(C \cap D) \subseteq f(C) \cap f(D)$

(d) $f^{-1}(E \cup F) = f^{-1}(E) \cup f^{-1}(F)$