Show All Solutions

Rosen, Discrete Mathematics and Its Applications, 7th edition
Extra Examples
Section 2.1—Sets

Extra Examples — *Page references correspond to locations of Extra Examples icons in the textbook.*

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p.116, icon at Example 4
#1. Write the set $\{2, 3, 4\}$ (given in list notation) in set builder notation.

See Solution

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p.116, icon at Example 4
#2. Write the set $\{\, x \mid x \in \mathbf{R},\ x^2 = 4 \text{ or } x^2 = 9 \,\}$ in list form.

See Solution

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p.116, icon at Example 4
#3. Write the set $\{\, x \mid x \in \mathbf{R}, x \text{ is a solution to } x^2 = -1 \,\}$ in list form.

See Solution

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p.116, icon at Example 4
#4. The same set can be written as a list in different ways.
For example,

$$\{\, 1, 2, 3, \ldots, 99 \,\} = \{\, 1, 2, 3, \ldots, 98, 99 \,\} = \{\, 1, 2, 3, 4, 5, \ldots, 97, 98, 99 \,\}.$$

These three sets all describe the set of positive integers less than 100. As long as the pattern is clear, you can use any number of terms before and after the ellipsis.

Write this set in set-builder notation.

See Solution

p.116, icon at Example 4

#5. Write the set $S = \{x \mid x \text{ is an even positive integer and } x \leq 64\}$ in list notation.

See Solution

p.121, icon at Example 13

#1. Determine whether each set is finite or infinite:

(a) $\{1, 10, 100, 1000, 10000, \ldots\}$.

(b) $\{1, 3, 5, 7, 9, \ldots, 599\}$.

(c) The set of all real number solutions to $x + 3 + 2x = 3(x + 1)$.

(d) The set of telephone numbers of the form "(XXX) XXX-XXXX" in the United States.

(e) The set of real number solutions to the equation $x^2 = -4$.

(f) $\{x \mid x \text{ an integer, } x^2 - 9x + 14 < 0\}$.

See Solution

p.121, icon at Example 13
#1. Let $S = \{\emptyset, a, \{a\}\}$. Determine whether each of these is an element of S, a subset of S, neither, or both.

(a) $\{a\}$
(b) $\{\{a\}\}$
(c) $\emptyset$
(d) $\{\{\emptyset\}, a\}$
(e) $\{\emptyset\}$
(f) $\{\emptyset, a\}$

See Solution

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p.121, icon at Example 13
#2.
(a) Prove that $\mathbf{P}(A) \cup \mathbf{P}(B) \subseteq \mathbf{P}(A \cup B)$ is true for all sets A and B.

(b) Prove that the converse of (a) is not true. That is, prove that $\mathbf{P}(A \cup B) \subseteq \mathbf{P}(A) \cup \mathbf{P}(B)$ is false for some sets A and B.

See Solution

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p.121, icon at Example 13

#3. Suppose that A and B are sets such that $\mathbf{P}(A \cup B) \subseteq \mathbf{P}(A) \cup \mathbf{P}(B)$. Prove that $A \subseteq B$ or $B \subseteq A$.

See Solution

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p. 122, icon at Example 14

1. What is the power set of the set $\{1, a, b\}$?

See Solution

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p. 122, icon at Example 14

2. What is the power set of the set $\{\emptyset, \{0\}\}$?

See Solution

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p.123, icon at Example 16

#1. The set $\mathbf{R} \times \mathbf{R} = \{(x, y) \mid x \in \mathbf{R}, y \in \mathbf{R}\} = \mathbf{R}^2$ is the xy-plane. Of particular interest is any subset of $\mathbf{R}^2$ defined by $\{(x, y) \mid x \in \mathbf{R}, y \in \mathbf{R}, y = f(x)\}$ where $f\colon \mathbf{R} \to \mathbf{R}$ is a function. This set of points is the graph of the function. For example, $\{(x, y) \mid x \in \mathbf{R}, y = x^2\} = \{(x, x^2) \mid x \in \mathbf{R}\}$ is the graph of a parabola.

More generally, any "relation" between real numbers x and y can be described as a subset of the Cartesian product $\mathbf{R} \times \mathbf{R}$. For example, $\{(x, y) \mid x \in \mathbf{R}, y \in \mathbf{R}, x^2 + y^2 = 1\}$ is the graph of the circle of radius 1 with center at the origin. The set $\{(x, y) \mid x \in \mathbf{R}, y \in \mathbf{R}, x < y\}$ is the portion of the plane above the diagonal line $y = x$.
