Functions

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A relation is a correspondence between two sets. Elements of the first set are called the *domain*. Elements of the second set are called the *range*. 
A function is a specific type of a relation where each element in the domain corresponds to exactly one element in the range.
Example 1.

Determine the domain and range of the following relation. Does the relation define a function?

\{(Joseph, turkey), (Joseph, roast beef), (Michael, ham)\}

Domain:
Example 1.

Determine the domain and range of the following relation. Does the relation define a function?

\{ (Joseph, turkey), (Joseph, roast beef), (Michael, ham) \}

Domain: \{ Joseph, Michael \}

Range:
Determine the domain and range of the following relation. Does the relation define a function?

\{(Joseph, turkey), (Joseph, roast beef), (Michael, ham)\}

Domain: \{Joseph, Michael\}

Range: \{turkey, roast beef, ham\}

Function?
Example 1.

Determine the domain and range of the following relation. Does the relation define a function?

\{(Joseph, turkey), (Joseph, roast beef), (Michael, ham)\}

Domain: \{Joseph, Michael\}

Range: \{turkey, roast beef, ham\}

Function? No, this relation is not a function.
Example 2.

Determine the domain and range of the following relation. Does the relation define a function?

\{(1, 3), (2, 4), (−1, 1)\}

Domain:
Example 2.

Determine the domain and range of the following relation. Does the relation define a function?

\{(1, 3), (2, 4), (−1, 1)\}

Domain: \{-1, 1, 2\}

Range:
Example 2.

Determine the domain and range of the following relation. Does the relation define a function?

\{(1, 3), (2, 4), (−1, 1)\}

Domain: \{-1, 1, 2\}

Range: \{1, 3, 4\}

Function?
Example 2.

Determine the domain and range of the following relation. Does the relation define a function?

\{(1, 3), (2, 4), (−1, 1)\}

Domain: \{-1, 1, 2\}

Range: \{1, 3, 4\}

Function? Yes, this relation is a function.
Determine the domain and range of the following relation. Does the relation define a function?

\{(3, 5), (4, 5), (5, 5)\}

Domain:
Determine the domain and range of the following relation. Does the relation define a function?

\[ \{(3, 5), (4, 5), (5, 5)\} \]

Domain: \{3, 4, 5\}

Range:
Example 3.

Determine the domain and range of the following relation. Does the relation define a function?

\{(3, 5), (4, 5), (5, 5)\}

Domain: \{3, 4, 5\}

Range: \{5\}

Function?
Example 3.

Determine the domain and range of the following relation. Does the relation define a function?

\{(3, 5), (4, 5), (5, 5)\}

Domain: \{3, 4, 5\}

Range: \{5\}

Function? Yes, this relation is a function.
Determine whether the equation defines $y$ as a function of $x$.

$x^2 + y = 1$
Example 5.

Determine whether the equation defines $y$ as a function of $x$.

$$x + y^2 = 1$$
Example 6.

Determine whether the equation defines $y$ as a function of $x$.

\[ x^2 + y^2 = 1 \]
Example 7.

Determine whether the equation defines $y$ as a function of $x$.

\[ x^3 + y^3 = 1 \]
Example 8.

Evaluate the function for the given values.

\[ f(x) = x^2 + 2x + 1 \]

\[ f(4) = \]

\[ f(-x) = \]

\[ f(x + h) = \]
Example 9.

Evaluate the function for the given values.

\[ f(x) = x^2 - x - 6 \]

\[ f(-3) = \]

\[ f(-x) = \]

\[ f(x + h) = \]
Evaluate the function for the given values.

\[ f(x) = x^3 - 3x^2 + 3x - 1 \]

\[ f(2) = \]

\[ f(-x) = \]