# 1.3 Functions and Their Representations

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# Definition

A function, *f*, is a rule that assigns to each element, *x*, in a set, *A*, exactly one element, *f(x)*, in a set, *B*.



A
Domain
"Input"

B
Range
"Output"

*x* is called the independent variable and *y* is called the dependent variable.

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# Notation

- *y* is the same thing as *f(x)*. This is the output of the function.
- *x* is the input to the function.
- **Example:** *f(1)* is the notation for the *y*-value that corresponds to the *x*-value of 1.

## Example

For the given function, evaluate at each value

**a.** $f(x) = 2x^2 - 5x + 3$

    **i.** $f(0)$

    **ii.** $f(-4)$

**b.** $h(z) = \sqrt{z}$

    **i.** $h(0)$

    **ii.** $h(49)$

    **iii.** $h(-9)$

**c.** $g(y) = 3y + 2$

    **i.** $g(-1)$

    **ii.** $g(y + h)$

    **iii.** $\dfrac{g(y+h) - g(y)}{h}$

## Domain & Range

- The domain consists of all values of the independent variable, $x$, allowed in the function.

- The range consists of all values of the dependent variable, $f(x)$ or $y$, that result as the independent variable takes on values across the domain.

## Rules for finding the domain of an algebraic function

- If the function is a fraction, set the denominator equal to zero and solve for $x$. These are the values to EXCLUDE from the domain.
- If the function is an EVEN radical, set what's under the radical greater than or equal to zero. Solve for $x$ to obtain the domain.
- The above rules can be combined.
- If neither of the first two rules applies, the domain is all real numbers.

## Example

Find the domain

   **a.** $f(x) = 2x - 5, \quad -3 \le x \le 7$
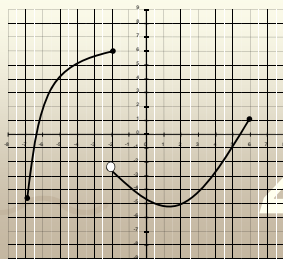
   **b.** $g(t) = \sqrt{t}$

   **c.** $h(x) = \dfrac{1}{2x - 5}$

   **d.** $f(p) = \dfrac{2p + 3}{\sqrt{p}}$

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## Example

Find the domain and range



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## Vertical Line Test

If no vertical line intersects a graph in more than one place, then the graph represents a function.