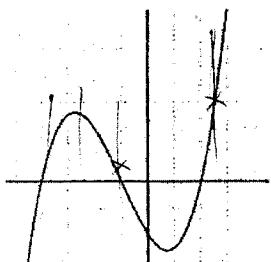


function — a relation in which every x -value is paired with exactly one y -value

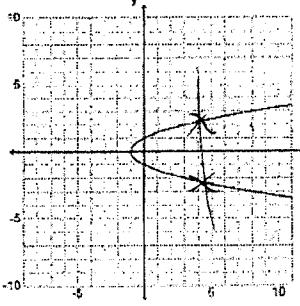
function notation — $f(x)$ "f of x "
same as y

How to determine if a relation is a function . . . use the VLT

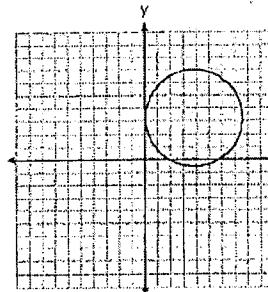
Example 1 Determine if the following are functions:



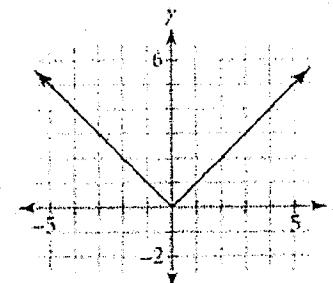
yes



no



no



yes

Interval Notation

	inequality notation	interval notation
if you want to <i>include</i> a number in an interval	\geq, \leq	$[]$
if you want to <i>exclude</i> a number in an interval	$>, <$	$()$

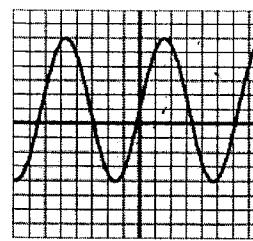
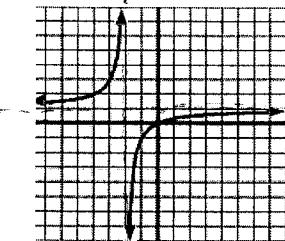
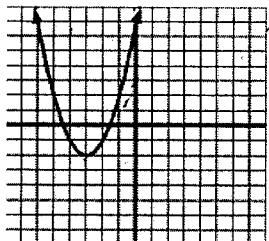
Example 2 Describe the shaded interval for each of the following (use BOTH inequality and interval notation):

	inequality notation	interval notation
	$x \geq 1$	$[1, \infty)$
	$x < -3 \text{ OR } -1 \leq x < 5$	$(-\infty, -3) \cup [-1, 5)$
	$x < -2 \text{ OR } x > -2$	$(-\infty, -2) \cup (-2, \infty)$

domain — set of all input values (x -values)

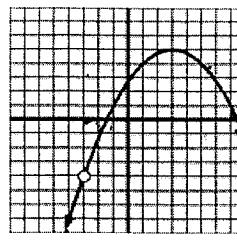
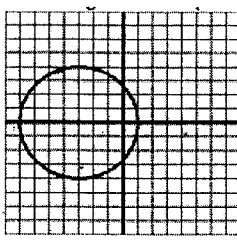
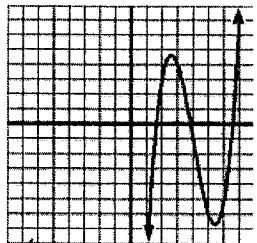
range — set of all output values based upon the domain (y -values)

Example 3 Identify the domain and range for each of the following (use BOTH inequality and interval notation):



inequality notation	D: all real #'s \mathbb{R} R: $y \geq -2$	D: $\mathbb{R}, x \neq -2$ R: $\mathbb{R}, y \neq 1$	D: \mathbb{R} R: all real #'s $-4 \leq y \leq 6$
interval notation	D: $(-\infty, \infty)$ R: $[-2, \infty)$	D: $(-\infty, -2) \cup (-2, \infty)$ R: $(-\infty, 1) \cup (1, \infty)$	D: $(-\infty, \infty)$ R: $[-4, 6]$

Example 4 Identify the domain and range for each of the following using interval notation:



$$D: (-\infty, \infty)$$

$$R: (-\infty, \infty)$$

$$D: [-1, 1]$$

$$R: [-4, 4]$$

$$D: (-\infty, -3) \cup (-3, \infty)$$

$$R: (-\infty, 5]$$

Hints to determine the domain algebraically ...

- Ask yourself what values can't be used. Your domain is everything else.
- The domain of all polynomial functions is the set of all real numbers.
- Square root functions cannot contain a negative under the radical. Set the expression under the radical greater than or equal to zero and solve for the variable. This will be your domain.
- Rational functions cannot have zeros in the denominator. Determine which values of the variable cause the denominator to equal zero. Your domain is everything else.

Example 5 Find the domain:

A. $f(x) = \sqrt{x+4}$

$$x+4 \geq 0$$

$$x \geq -4$$

$$[-4, \infty)$$

B. $g(x) = \frac{x^2}{3x^2-x-2}$

$$(3x+2)(x-1)$$

$$3x+2 \neq 0 \quad x-1 \neq 0$$

$$x \neq -\frac{2}{3}$$

$$x \neq 1$$

$$(-\infty, -\frac{2}{3}) \cup (-\frac{2}{3}, 1) \cup (1, \infty)$$

C. $f(x) = \frac{\sqrt{x}}{x^2-5x}$

$$x \geq 0$$

$$x(x-5)$$

$$x \neq 0 \quad x-5 \neq 0$$

$$x \neq 5$$

$$(0, 5) \cup (5, \infty)$$

Example 6 Find the domain and range (try to do without the aid of a calculator):

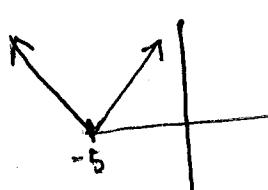
A. $h(x) = 3(x-4)^2 - 7$

$$D: (-\infty, \infty)$$

$$\text{vertex } (4, -7)$$



$$R: [-7, \infty)$$

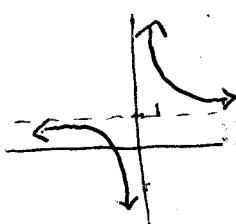


B. $f(x) = |x + 5|$

$$D: (-\infty, \infty)$$

$$R: [0, \infty)$$

C. $h(x) = \frac{1}{x} + 1$



$$D: (-\infty, 0) \cup (0, \infty)$$

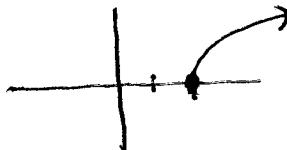
$$R: (-\infty, 1) \cup (1, \infty)$$

D. $k(x) = 2x^3 + 5$

$$D: (-\infty, \infty)$$

$$R: (-\infty, \infty)$$

E. $y = \sqrt{x-2}$



$$D: [2, \infty)$$

$$R: [0, \infty)$$

F. $y = \sqrt{16 - x^2}$



$$D: [-4, 4]$$

$$R: [0, 4]$$