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Questions

3.2 More About Functions

a) Domain and Range of a function

chapter 3 section 2 more about functions

Relation: *a set of ordered pairs.*

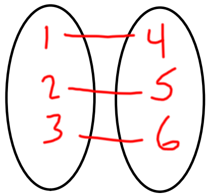
{(3, 2),(-1 , 5),(0, 2)}

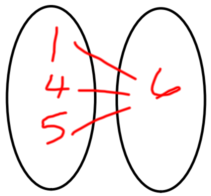
Domain: *all of the first coordinates of a relation*

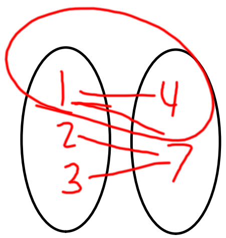
(think of the domain as the inputs). 3, -1 , 0

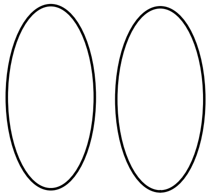
Range: *all of the 2nd coordinates of a relation*

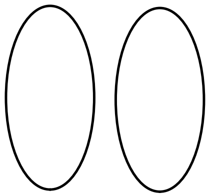
(think of the range as the outputs). 2, 5, 2

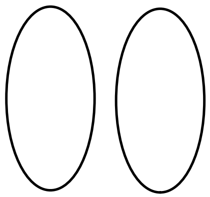












the first variable (x) is the independent variable.
It is called the Domain (the complete set of all possible x values)

the second variable (y) is the dependent variable.
It is called the Range (the complete set of all possible y values)

the domain and range are sets of real numbers

$\frac{0}{15}$ $\frac{15}{0}$

1. The denominator cannot be zero.
2. The quantity under the square root (the radicand) must be greater than or equal to zero in order for the function to be defined.

$f(x) = 2x - 3$

D: {all reals}

$f(x) = \frac{x+1}{x-1}$

$x - 1 = 0$
$+1 \quad +1$
$x = +1$

D: {all reals $x \neq 1$}

$g(x) = \sqrt{x-3}$

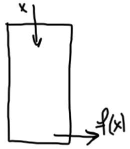
$x - 3 \geq 0$
$+3 \quad +3$
$x \geq 3$

D: {all reals $x \geq 3$}

$f(x) = x^2 + 1$

D: {all reals}

Determine the domains of the following function



1) $f(x) = x^2 + 2x - 3$

D: {all real #}

2) $g(x) = \frac{x+3}{x-4}$

$x - 4 = 0$
$x = 4$

D: {all reals $x \neq 4$}

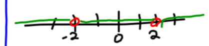
3) $h(x) = \sqrt{x-2}$

$x - 2 \geq 0$

D: {all reals $x \geq 2$}

4) $f(x) = \frac{1}{x-2} + \frac{1}{x+2}$

D: {all reals $x \neq 2$ or -2}



5) $g(y) = \frac{\sqrt{y-3}}{y-4}$ $\quad \sqrt{-1}$

D: {all reals $y \geq 3$; $y \neq 4$}

$y - 3 \geq 0$
$+3 \quad +3$
$y \geq 3$

$y - 4 = 0$
$y \neq 4$

$$f(x) = \sqrt{3 - x}$$

$$3 - x \geq 0$$
$$-3 \qquad -3$$

$$\frac{-x}{-1} \geq \frac{-3}{-1}$$

$$x \leq 3$$

Examples

① $f(x) = x$

D: { all reals }

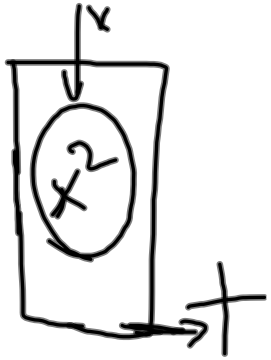
R: { all reals }

② $f(x) = x^2$

D: { all reals }

R: { all reals $f(x) \geq 0$ }

$y \geq 0$



③ $g(x) = x^2 + 1$

D: { all reals }

R: { all reals $f(x) \geq 1$ }

④ $h(x) = \sqrt{x - 2}$

D: { all reals $x \geq 2$ }

R: { all reals $f(x) \geq 0$ }

$f(x) = 2x+1$

D: {all reals}

R: {all reals}

$f(x) = x^2$

$f(x) = \frac{x+1}{x-1}$

$x - 1 = 0$

$+1 \quad +1$

$x = 1$

D: {all reals $x \neq 1$}

R: {all reals ...}

$g(x) = \sqrt{x-1}$

$x - 1 \geq 0$

$+1 \quad +1$

$x \geq 1$

D: {all reals $x \geq 1$}

R: {all reals $g(x) \geq 0$}

examples of piecewise functions

Not all functions must have the same definition across their entire domain.
Some functions have
different definitions for different intervals of their domain;
this type of function is called a piecewise function.

$$f(x) = \begin{cases} 8 - 2x & (\text{for } 0 \le x \le 5) \\ 0 & (\text{for } x > 5) \end{cases}$$

find x = 3, x = 6, x = -1

$f(3) = 8 - 2(3) = 2$

$f(-1) =$ undefined

example

$$f(x) = \begin{cases} 2x-1 & ; \quad x \leq 2 \\ x^2+1 & ; \quad x > 2 \end{cases}$$

$$f(3) = 3^2 + 1 = 10$$

$$f(0) = 2 \cdot 0 - 1 = -1$$

$$f(2) = 2 \cdot 2 - 1 = 3$$

Functions from Verbal Statements

Crystal travels at 55 miles per hour for 2 hours and then at 65 miles per hour for x hours.
Express the distance d traveled as a function of x.

2hr
× 55

X hr
· 65

$d(x) = 65x + 2 * 55$

$d(x) = (65x + 110)$ miles

Express the cost C of insulating a cylindrical water tank of height 3 meters as a function of its radius r, if the cost of insulation is $3 per square meter.

$C(r) = 2r\pi \times 3$

$C(r) = 6r\pi \cdot \$3$

$C(r) = (18r\pi)$ dollars

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