10.5 Technical Def of a Function (cont'd)

Informally, a function's

formula

$f(x) = x^2$

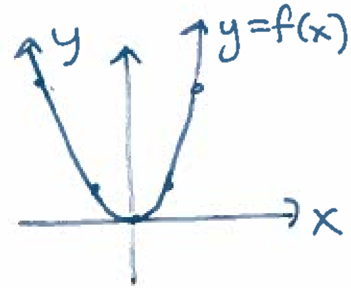
verbal descript

f takes its input and squares it

table

x	$f(x)$
-2	4
-1	1
0	0
1	1
2	4

graph



technical: $\{(-2,4), (-1,1), (0,0),$ and only many more $\}$

a function is a collection of ordered pairs where each x-value is paired with at most one y-value.

Some things don't give functions...

Table

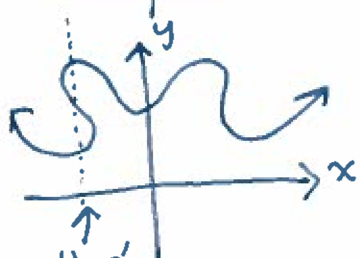
x	y
-3	1
-1	5
-3	7
4	8

same x-val

with diff't y-values

does not make y a function of x

Graph



there's an x-value with more than y-value.

Verbal

Is a person's income (annual) a function of their age?

input	output
38	30,000
38	40,000

diffent outputs, for same input.

Equations in x and y.

Ex $y = x^2 + 1$. Is y a function of x? (Yes!)

imagine using some number for x as input...

an output value comes out for y.

Ex $2x + 3y = 5$. Is y a function of x? (Yes!)

put in some x-value...

you will be able to solve for y.

$$3y = 5 - 2x$$
$$y = \frac{5-2x}{3}$$

Ex $y = \pm\sqrt{x+4}$ Is y a function of x?

plug in some x-value, say 5.

two outputs! +3 and −3.

So, no! one input can give two outputs.

Ex $x^2 + y^2 = 9$ Is y a function of x? No!

say, plug in 2.

$\sqrt{5}$ and $-\sqrt{5}$ come out...

$$2^2 + y^2 = 9$$
$$4 + y^2 = 9$$
$$y^2 = 5$$
$$y = \pm\sqrt{5}$$

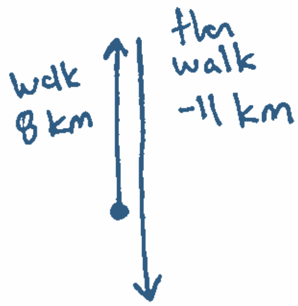
Ch 11 Absolute Value Functions

Review (see section 1.3 of the book)

Ex $|5| = 5$ $\qquad |-12| = 12$

signals to take the positive version of whatever one number is in there

In context,



How much distance was that in total?

Everyday English

$8 + 11 = 19$

Alternatively:

$|8| + |-11| = 19$

addition because two legs

keep track of the existence of neg. direction

Also look at

$$|8 + (-11)|$$
$$= |-3|$$
$$= 3$$

In the end this person is 3km away from where they started.

Ex Let f be defined by $f(x) = |x|$.

$f(12) = 12 \qquad f(-8) = 8 \qquad f(0) = 0$

Ex Let g be defined by $g(x) = |4x+3|$

$$g(5) = |4(5)+3| = |23| = 23$$

$$g(-5) = |4(-5)+3| = |-17| = 17$$

Plot with GGB

$f(x) = |x|$

$f(x) = |x+3|$

$f(x) = -|x+3|$

$f(x) = -2|x+3|$

$f(x) = 4-2|x+3|$

Let $f(x) = \sqrt{x^2}$

$f(3) = \sqrt{3^2} = \sqrt{9} = 3$

$f(2) = \sqrt{2^2} = \sqrt{4} = 2$

$f(1) = \sqrt{1^2} = \sqrt{1} = 1$

$f(0) = \sqrt{0^2} = \sqrt{0} = 0$

$f(-1) = \sqrt{(-1)^2} = \sqrt{1} = 1$

now input and output are different!

$f(-2) = \sqrt{(-2)^2} = \sqrt{4} = 2$

again

Fact

$$\sqrt{x^2} = |x|$$

(do you feel that $\sqrt{x^2} = x$? only true if x is positive, because $|x| = x$.

Ex Simplify $\sqrt{(x-2)^2}$.

$= |x-2|$

radical and squaring sort of cancel... but they leave abs value bars in the aftermath

Ex Simplify $\sqrt{x^2+10x+25}$.

$= \sqrt{(x+5)^2}$

$= |x+5|$

$x^2 + 10x + 25$

$2 \cdot 5 \quad 5^2$

$(x+5)^2$

Simplify $\sqrt{x^6} = \sqrt{(x^3)^2}$

$= |x^3|$