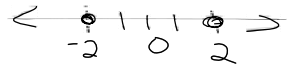
1-6 Absolute Value Equations and Inequalities

Solve and graph each equiation on a number line. Be sure to check your solutions.

Always check your solutions in the **ORIGINAL** problem

1. $|x| = 2$

$x = 2$ or $x = -2$



Check

$|2| = 2$

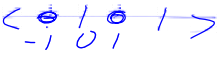
$2 = 2$ ✓

$|-2| = 2$

$2 = 2$ ✓

2. $|x| = 1$

$x = 1$ or $x = -1$



Check

$|1| = 1$

$1 = 1$ ✓

$|-1| = 1$

$1 = 1$ ✓

3. $|x+2| = 5$

$x + 2 = 5$ or $x + 2 = -5$

$-2 \quad -2 \qquad -2 \quad -2$

$x = 3$ or $x = -7$

Check

$|3+2| = 5$

$|5| = 5$

$5 = 5$ ✓

$|-7+2| = 5$

$|-5| = 5$

$5 = 5$ ✓

4. $|2x+3| - 1 = 2$

Isolate the | | before 2 parts

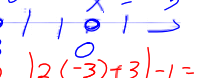
$|2x+3| = 3$

$2x + 3 = 3$ or $2x + 3 = -3$

$-3 \quad -3 \qquad -3 \quad -3$

$\frac{2x}{2} = \frac{0}{2} \qquad \frac{2x}{2} = \frac{-6}{2}$

$x = 0$ or $x = -3$



Check

$|2(0)+3| - 1 = 2$

$|0+3| - 1 = 2$

$|3| - 1 = 2$

$3 - 1 = 2$

$2 = 2$ ✓

$|2(-3)+3| - 1 = 2$

$|-6+3| - 1 = 2$

$|-3| - 1 = 2$

$3 - 1 = 2$

$2 = 2$ ✓

5. $-3|x-1| + 5 = 8$

$-5 \quad -5$

$\frac{-3}{-3}|x-1| = \frac{3}{-3}$

$|x-1| = -1$

absolute value of something cannot be negative!

not possible!

Therefore,

NO solution

Check

6. $|x-1| = 5x+10$

$x - 1 = 5x + 10$ or $x - 1 = -5x - 10$

$-x \quad -10 \qquad -x \quad -10 \qquad +5x \quad +1 \qquad +5x \quad +1$

$\frac{-11}{4} = \frac{4x}{4} \qquad \frac{6x}{6} = \frac{-9}{6}$

$x = \frac{-11}{4}$ or $x = \frac{-3}{2}$

Check

$|x-1| = 5x+10$

$\left|-\frac{11}{4} - \frac{4}{4}\right| = 5\left(\frac{-11}{4}\right) + 10$

$\left|\frac{-15}{4}\right| = -\frac{55}{4} + \frac{40}{4}$

$\frac{15}{4} = \frac{-15}{4}$ ✗

so $x = \frac{-11}{4}$ not a solution

$\left|-\frac{3}{2} - 1\frac{2}{2}\right| = 5\left(\frac{-3}{2}\right) + 10$

$\left|\frac{-5}{2}\right| = -\frac{15}{2} + 10 = \frac{20}{2}$

$\frac{5}{2} = \frac{5}{2}$ ✓

so $x = \frac{-3}{2}$

1-6 Continued...Absolute Value Inequalities

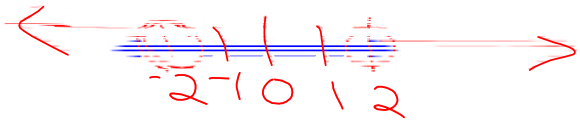
Solve and graph each inequality on a number line.

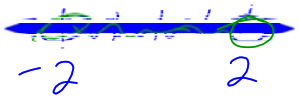
1. $|x| > 2$ greator

2. $|x| < 2$ less than and

Hmm...what numbers have an absolute value greater than 2? LOTS!! } Graph 'em!

Hmm...what numbers have an absolute value less than 2? LOTS!! } Graph 'em!





Does this look like an "and" or an "or" graph?

Does this look like an "and" or an "or" graph?

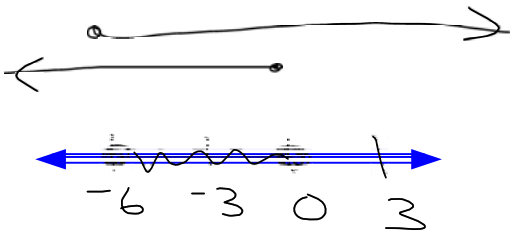
Remember, isolate the absolute value first, **then** decide if it's an "and" or an "or".(Great"or" Less th"and")

3. $|x+3| \le 3$ AND

$x+3 \le 3$ and $x+3 \ge -3$

$-3 \quad -3 \qquad -3 \quad -3$

$x \le 0$ and $x \ge -6$



Answer: $-6 \le x \le 0$

4. ~~$-2|x-1| < -6$~~ Skipped this one

Answer:

5. $\left|\frac{3-5x}{2}\right| \le -2$

NOT possible

NO Solution

$|\ |$ cannot be negative

Answer:

6. $14 > -2|x-1| + 8$

Hmmmm.....

put abs value on left side of inequality

$-2|x-1| + 8 < 14$

$-8 \quad -8$

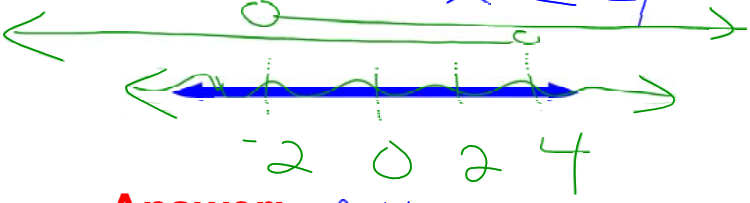
$\frac{-2|x-1|}{-2} < \frac{6}{-2}$

$|x-1| > -3$ OR

$x-1 > -3$ or $x-1 < 3$

$+1 \quad +1 \qquad +1 \quad +1$

$x > -2$ or $x < 4$



Answer: All real numbers

$\mathbb{R}$

2.1 Functions!

Domain: input

Range: output

What is a function?
A function is a relation that has exactly one y-value for each x-value.

For each relation state the domain, range, and if it is a function (explain how you know).

a) (3,1), (2,1), (-4,1),(9,0)

Domain: { 3, 2, -4, 9 }

Range: { 1, 0 }

Function?? How do you know?

yes it's a function every x-value has exactly one y-value.

b)

x	y
-2	4
3	3
-7	2
-2	1

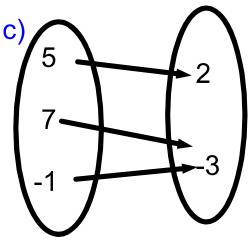
Domain: { -2, 3, -7 }

Range: { 4, 3, 2, 1 }

Function?? How do you know?

NOT A Function because the x-value, -2, has two y-values.

c)



Domain: { 5, 7, -1 }

Range: { 2, -3 }

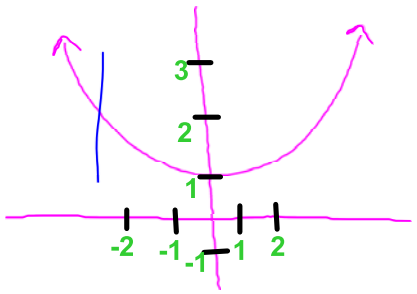
Function?? How do you know?

yes a function. Every x-value has exactly one y-value.

vertical line test

For each relation state the domain, range, and if it is a function (explain how you know).

d)

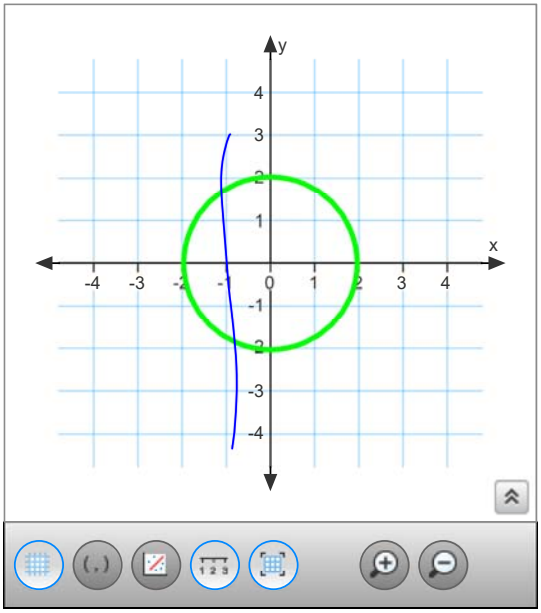


domain: all real #'s

range: $y \geq 1$

It is a function because vertical line only intersection at one point.

e)



domain: $-2 \leq x \leq 2$

range: $-2 \leq y \leq 2$

It is not a function because vertical line intersects in more than one point.