You should be wrasslin' with 1.6 by today.

If $ax^2+bx+c=0$, then
$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$x^2-2x+20=0$

$a=1,\ b=-2,\ c=20$

Do b^2-4ac = discriminant =

$(-2)^2-4(1)(20)=4-80=-76$

2 nonreal solutions.

Look ahead

$\pm\sqrt{-76}$

$2\,|\,76$
$2\,|\,38$
19

Scratch: $\sqrt{-76}=i\sqrt{2\cdot 2\cdot 19}$

$=2i\sqrt{19}$

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-(-2)\pm 2i\sqrt{19}}{2(1)}=\frac{2\pm 2i\sqrt{19}}{2}$$

$$=\frac{\cancel{2}^{1}(1\pm i\sqrt{19})}{\cancel{2}_{1}}=1\pm i\sqrt{19}$$

only cancel factors with factors, and now it's 2 times EVERYTHING on top.

Coming soon to math class near you: This means

$x^2-2x+20=(x-(1+i\sqrt{19}))(x-(1-i\sqrt{19}))$

Any time you have zeros, you get factors!

FACTOR THEOREM, CHAPTER 3.

Proof

$(x-(1+i\sqrt{19}))(x-(1-i\sqrt{19}))=$

$=x^2-x(1-i\sqrt{19})-(1+i\sqrt{19})x+(1+i\sqrt{19})(1-i\sqrt{19})$

$=x^2-x+xi\sqrt{19}-1x-i\sqrt{19}\,x+(1)(1)-(1)(i\sqrt{19})+(i\sqrt{19})(1)-(i\sqrt{19})(i\sqrt{19})$

$=x^2-x-x+1-i^2(\sqrt{19})^2$

$=x^2-2x+1+19=x^2-2x+20$

$$x^2-5x+6 = (x-2)(x-3) = 0 \implies x \in \{2,3\}$$

$a=1,\ b=-5,\ c=6$

$b^2-4ac = (-5)^2-4(1)(6) = 25-24 = 1$

1 is a perfect square. Always happens when it has rational solutions.

$$x = \frac{-(-5)\pm\sqrt{1}}{2(1)} = \frac{5\pm 1}{2} \quad \frac{5+1}{2}=3, \quad \frac{5-1}{2}=2$$

See?

Now that we know the zeros, we can factor using that info.

$$(x-2)(x-3)$$

Factor this: $\boxed{10x^2+3x-18}$

$$\begin{array}{r|l} 3 & 729 \\ 3 & 243 \\ 3 & 81 \\ 3 & 27 \\ 3 & 9 \\ & 3 \end{array}$$

$a=10,\ b=3,\ c=-18$

$b^2-4ac = 3^2-4(10)(-18) = 9+720 = 729$

$\sqrt{729} = \sqrt{3\cdot 3\cdot 3\cdot 3\cdot 3\cdot 3} = 3\cdot 3\cdot 3 = 27$

$$x = \frac{-b\pm\sqrt{b^2-4ac}}{2a} = \frac{-3\pm 27}{2(10)} = \frac{-3\pm 27}{20}$$

$$= \frac{-3+27}{20} = \frac{24}{20} = \frac{6}{5}$$

$$\frac{-3-27}{20} = \frac{-30}{20} = -\frac{3}{2}$$

So, to factor, we write

$10\left(x-\frac{6}{5}\right)\left(x+\frac{3}{2}\right)$

Sledgehammer approach to factoring.

$= 5\cdot 2\left(x-\frac{6}{5}\right)\left(x+\frac{3}{2}\right)$

$= 5\left(x-\frac{6}{5}\right)(2)\left(x+\frac{3}{2}\right)$

$= (5x-6)(2x+3)$ Factored beautifully.

§1.7 Absolute value inequalities

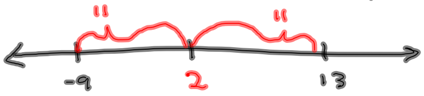
Recall: $|x| = 7 \Rightarrow$

$$\underbrace{x = 7 \quad \text{OR} \quad x = -7}_{x = \pm 7}$$

$|x-2| = 11$

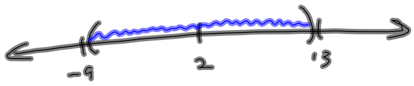
$x - 2 = \pm 11$

$x = 2 \pm 11 \to 2+11 = 13, \quad 2-11 = -9$



$|x-2|$ means distance from x to 2.

$|x-2| < 11$ is the interval between $x = -9$ & $x = 13$

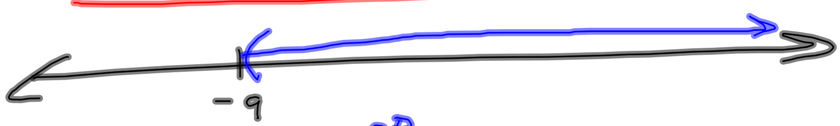


$= (-9, 13)$

$= \{x \mid -9 < x < 13\}$

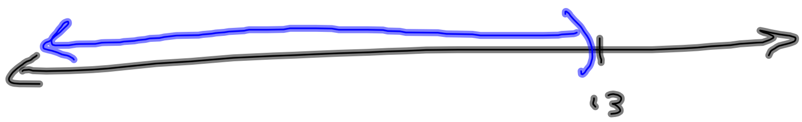
$= \{x \mid -9 < x \text{ AND } x < 13\}$

what about $\boxed{\{x \mid -9 < x \text{ OR } x < 13\}}$?

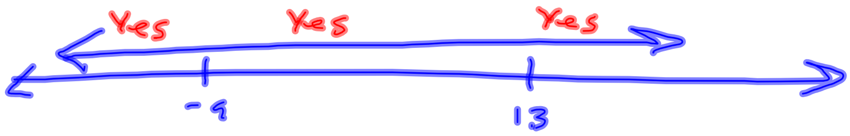


$x > -9$

OR



$x < 13$



$= (-\infty, \infty)$

when it's "And", only the bit in the middle is good.

"OR" is more welcoming.

$|3x-2| < 5$ "<" use AND

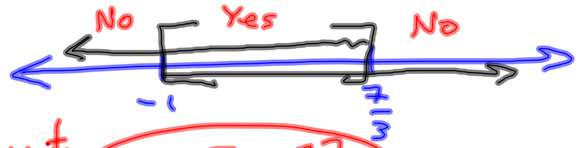
$3x - 2 < 5$ AND $3x-2 > -5$

$\dfrac{+2 = +2}{3x < 7}$ Maria $\dfrac{+2 = +2}{3x > -3}$

$\dfrac{3x}{3} < \dfrac{7}{3}$ $\dfrac{3x}{3} > \dfrac{-3}{3}$

$x < \frac{7}{3}$ AND $x > -1$

Keep 'em both happy



Not quite $x \in [-1, \frac{7}{3}]$ But square brackets are wrong.

It's < & >, not ≤ & ≥.

$\boxed{x \in (-1, \frac{7}{3}) \text{ is correct.}}$

Should use ( ), not [ ]

$|3x-2| > 5$

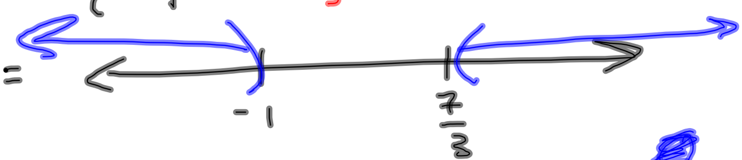
$3x-2 > 5$ OR $3x-2 < -5$

Same algebra steps.

⋮

$\{x \mid x > \frac{7}{3} \text{ OR } x < -1\}$ Solution set.

=



$= (-\infty, -1) \cup (\frac{7}{3}, \infty)$

Union OR

Quadratic Equations
Absolute Value
Inequalities.

This room:

Free b4 & after class

Office hour for Kalista here on Mondays before class?

I can hold an hour here, also.