

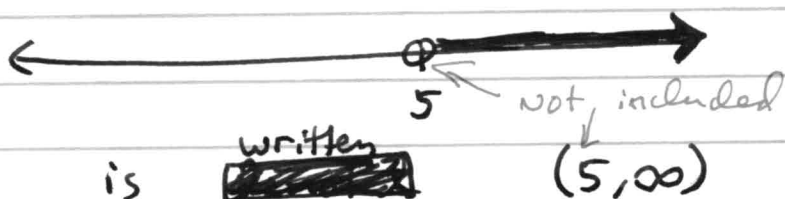
Calculus is dynamic,
but individual #'s are static.

we will ^{often} need to discuss certain sets of #'s.
we begin w/ ^{imp}~~and~~ notation.

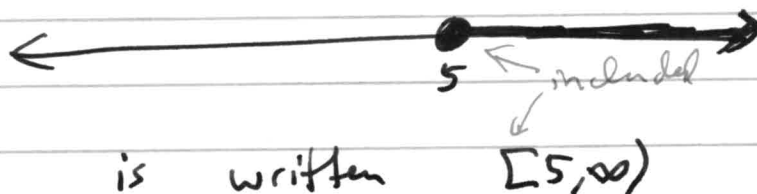
↑
TODAY'S GOAL

"find the set of
 x such that
 $x^2 - 4x + 3 > 0$ "

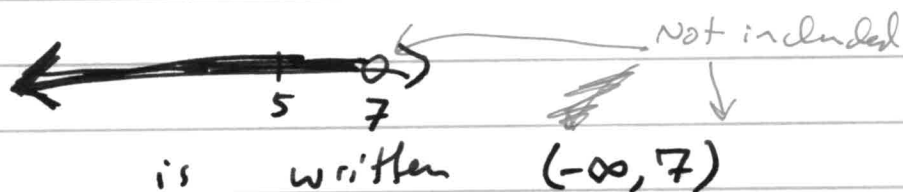
The set of #'s x such that $x > 5$



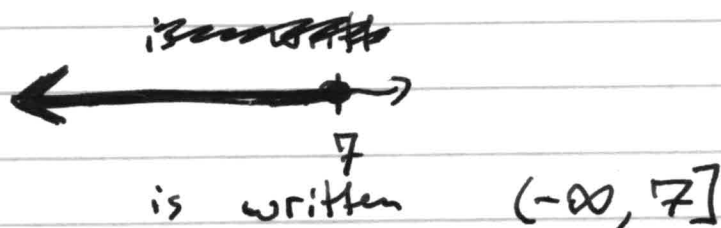
The set of #'s x such that $x \geq 5$



The set of x ~~s.t.~~ s.t. $x < 7$



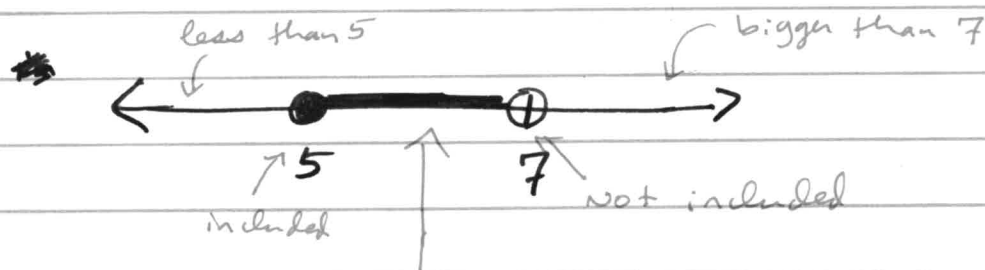
the set of x s.t. $x \leq 7$



~~TO~~
Do Fast!

We can combine these:

the x s.t. $5 \leq x < 7$



5

bigger than 5
AND
less than 7

is written $[5, 7)$

: the x s.t. $5 < x \leq 7$

is written $(5, 7]$

SKIP

the x s.t. ~~5 ≤ x < 7~~ $5 \leq x \leq 7$

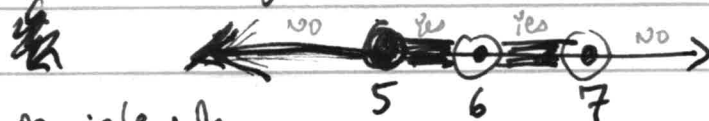
is $[5, 7]$

the x s.t. $5 < x < 7$ is

is $(5, 7)$

How to write " $5 \leq x < 7$ BUT $x \neq 6$ "?

① Draw picture & shade known points



② fill in intervals
left to right

\cup stands for UNITE

③ $[5, 6)$ united $(6, 7]$ → written $[5, 6) \cup (6, 7]$

find x s.t.

$$-2x - 8 \geq 10$$

~~compare this to~~

SAME as solving an Eqn

Except you flip the \geq if you multiply both sides by $\boxed{-1}$.

$$-2x + 1 \geq 19$$

$$-2x \geq 18$$

③

$$(-1) \cdot (-2x) \leq (-1) \cdot 18$$

$$2x \leq -18$$

$$x \leq -9$$

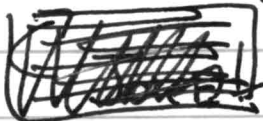
$$-2x + 1 \geq 19$$

~~is~~ is

true for x in $(-\infty, -9]$

Easy for just one x

~~for~~ for x^2 & up, we need a better idea:



DRAW A PICTURE!

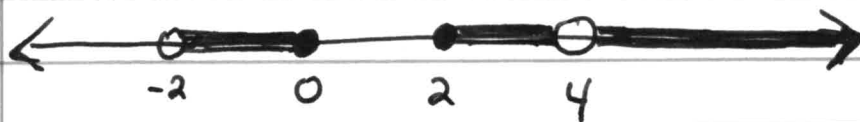
To find the set of x
satisfying some inequality

Step 1: find the x where $=$ holds
plot as \circ or \bullet on # line

Step 2: find the x where it is undefined
plot as \circ on # line

Step 3: Plug in #'s between each pair of points.
shade the interval
if
the inequality is true!

we'll get number lines like



write this as

~~$(-2, 0] \cup [2, 4) \cup (4, \infty)$~~

$$(-2, 0] \cup [2, 4) \cup (4, \infty)$$

Eg: find x s.t.

$$(x+1)(x-2) > 0$$

step 1: = holds when

$$x+1=0 \quad \text{or} \quad x-2=0$$

$$\text{so} \quad x=-1 \quad \text{or} \quad x=2$$



NOTICE: the equation is FALSE when $x=-1$ or $x=2$
 \Rightarrow plot open circles

step 2: always defined!

step 3:

check

$$x=0 \Rightarrow (0+1)(0-2) = (1)(-2) = -2 \quad \times$$

[Don't shade]

NOT bigger than 0

$$x=-2 \Rightarrow (-2+1)(-2-2) = (-1)(-4) = 4 \quad \checkmark$$

[Do shade]

Is bigger than 0

$$x=3 \Rightarrow (3+1)(3-2) = 4 \cdot 1 = 4 \quad \checkmark$$



This is written: $(-\infty, -1) \cup (2, \infty)$

Eg: find x s.t.

$$\frac{(x-1)(x+3)}{x+1} \leq 0$$

Step 1: = holds when

$$(x-1)=0 \quad \text{or} \quad (x+3)=0$$

$$x=1 \quad \text{or} \quad x=-3$$

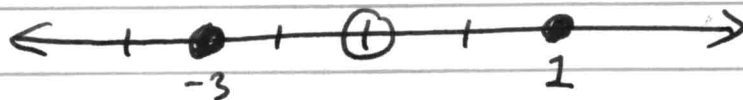
AND the inequality is TRUE when $x=1$ & $x=-3$
 \Rightarrow plot \bullet



Step 2: undefined when

$$x+1=0$$

\Rightarrow plot \circ
 \Rightarrow $x = -1$



Step 3: check each interval

$$x = -4 \Rightarrow \frac{(-4-1)(-4+3)}{(-4+1)} = \frac{(-5)(-1)}{(-1)} = -5 \quad \checkmark$$

$$x = -2 \Rightarrow \frac{(-2-1)(-2+3)}{(-2+1)} = \frac{(-3)(1)}{(-1)} = 3 \quad \times$$

$$x = 0 \Rightarrow \frac{(0-1)(0+3)}{0+1} = -3 \quad \checkmark$$

$$x = 2 \Rightarrow \frac{(2-1)(2+3)}{2+1} = \frac{1 \cdot 5}{3} = \frac{5}{3} \quad \times$$

this IS less than 0



The inequality $\frac{(x-1)(x+3)}{(x+1)} \leq 0$

is true for x in $(-\infty, -3] \cup (-1, 1]$