How proofs start?

(Axioms!)

Where do they come from?

BK Background knowledge

0 < 1 Prove it!

Yes this can be proved!

Euclid

Plane geometry

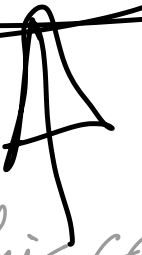
Axioms

We are not doing geometry, we are studying real numbers, $\mathbb{R}$

I will present

16 axioms for $\mathbb{R}$

$2+2=4$



this can be proved

What is 2?

D1 2 by definition $1+1$

D2 3 by def is $2+1$

D3 4 by def is $3+1$

Proof: $2+2 \overset{D1}{=} 2+(1+1) \overset{AA}{=} (2+1)+1$

$\overset{D2}{=} 3+1 \overset{D3}{=} 4$

Aloya: Humility!

Thank you!

We are all in service of

the Rigorous Reason!

End of the Introduction

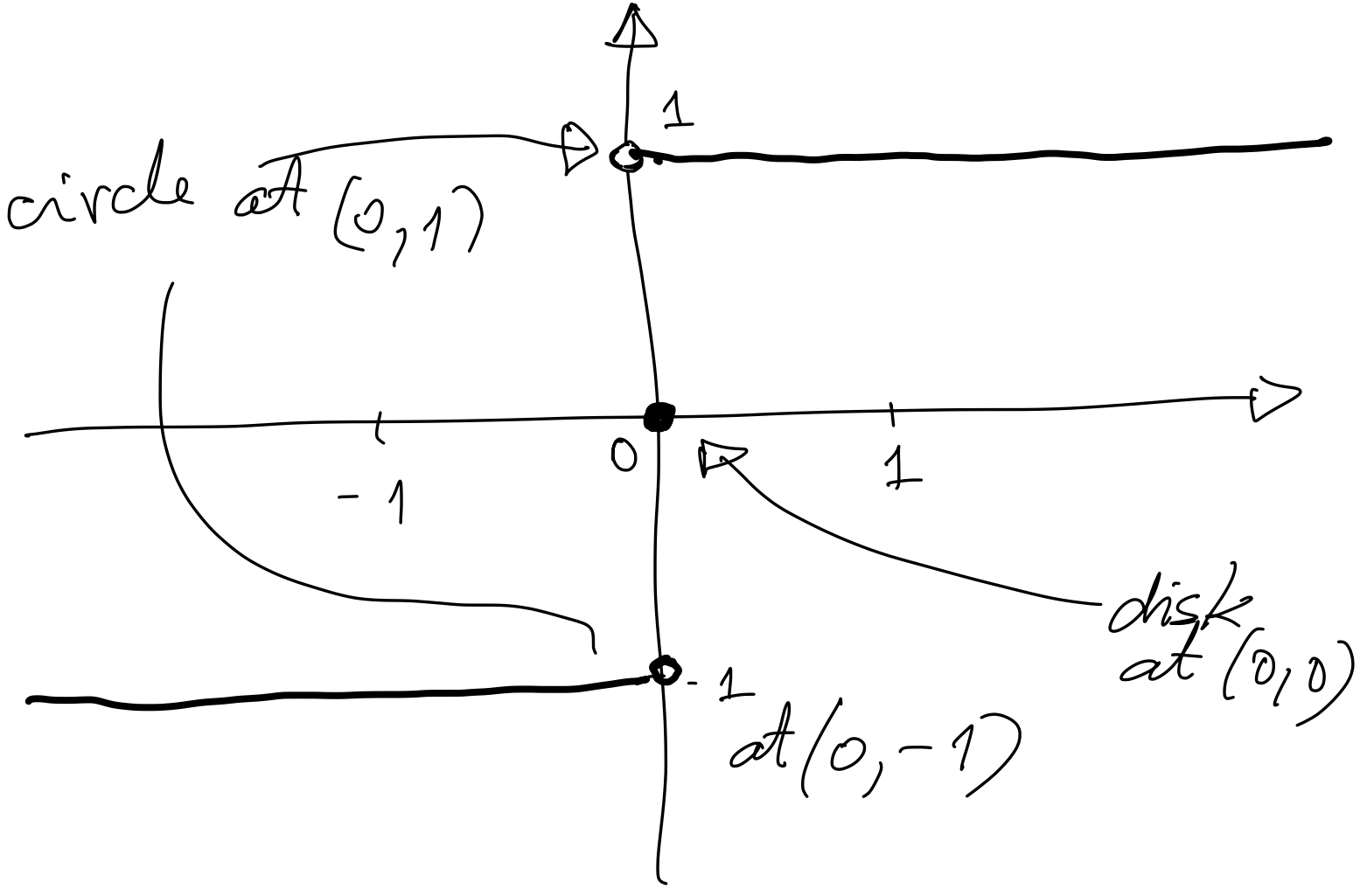
Functions

Your library of functions by now is HUGE.

exp, ln, cos, sin, tan, algebraic functions, rational functions, ...

Sign function?

$$\operatorname{sgn}(x) = \begin{cases} -1 & \text{if } x < 0 \\ 0 & \text{if } x = 0 \\ 1 & \text{if } x > 0 \end{cases}$$


1
circle at (0,1)
-1
0
1
disk
at (0,0)
-1
at (0,-1)