

September-11-12  
2:59 PM

I don't do email math.

What's not linked does not exist.

Elegance counts!

Read Along. Appendices A-D.

Riddle Along.  $1 = \sqrt{1} = \sqrt{(-1) \cdot (-1)} = \sqrt{-1} \cdot \sqrt{-1} = i \cdot i = -1$ A Field:  $(F, +, \cdot, 0 \neq 1)$  s.t.

F1 Commutativity:

F2 Associativity:

F3 Units

F4 Inverses

F5 Distributivity

Examples:

 $\mathbb{R}, \mathbb{Q}, \mathbb{C}, \mathbb{F}_p$   
& many more

Proofs ...

Thm 1.  $a+b=c+b \Rightarrow a=c$ 2.  $a \cdot b = c \cdot b, b \neq 0 \Rightarrow a=c$ 3. IF  $0'$  is like  $0$ , Then  $0' = 0$ 4. IF  $1'$  is like  $1$ , Then  $1' = 1$ 5. IF  $a+b=0=a+b'$  Then  $b=b'$   
(so we can define  $-a$ )6. IF  $a \neq 1$  &  $ab=1=ab' \Rightarrow b=b'$   
(so we can define  $a^{-1}$ )7.  $-(-a) = a, (a^{-1})^{-1} = a$ 8.  $a \cdot 0 = 0$ 9. There's no  $0^{-1}$ 10.  $(-a) \cdot b = a \cdot (-b) = -(a \cdot b)$ 11.  $(-a)(-b) = a \cdot b$ def: subtraction  $a-b$ ,  
division  $a/b$  when  $b \neq 0$ .done  
lineThat's  
hard!

12. ... character ...

## 4. D&E characteristic

previous Theme: "abstraction, generalization, definition, examples"

next: "dream, implications, formalization & proof".

Dream Add to  $\mathbb{R}$  some number  $i$  so that  $i^2 = -1$ .

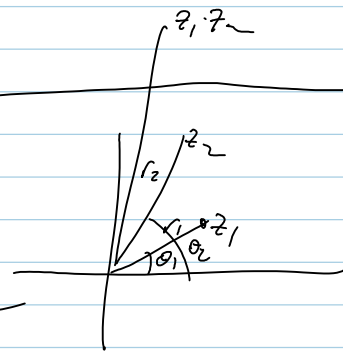
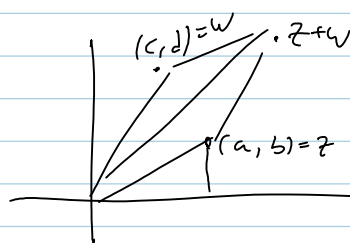
Implications must add  $7i$ ,  $3-7i$ ,  $(2+3i)(3-7i)$ ...

Formally define  $\mathbb{C}$  and verify Fieldness.

Thm Our definitions indeed make a Field!

(verify distributivity)

Interpretation



Dori's websites

<http://www.math.toronto.edu/~drorbn/People/Eldar/thesis/squaring.htm>

no.

Waves, AC, RLC

Why aren't we also adding  $\sqrt{i}$ ?