Date. Page.

$(a,b)\cdot(c,d) := (ac-bd,\ bc+ad)$

$-(a,b) := (-a,-b)$

$(a,b)^{-1} := \left(\frac{a}{a^2+b^2},\ \frac{-b}{a^2+b^2}\right)$

if $(a,b) \neq 0_{\mathbb{C}} = (0,0)$

$\Leftrightarrow a \neq 0 \wedge b \neq 0.$

$\tau : \mathbb{R} \longrightarrow \mathbb{C}$ by $(a \mapsto (a,0))$

$7 \longmapsto (7,0)$

$a,b,c \in \mathbb{R}$

$\tau(a\cdot b) = \tau(a)\cdot\tau(b)$

$\tau(a+b) = \tau(a)+\tau(b)$

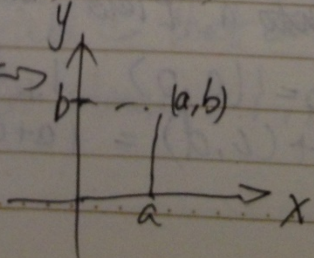
Thm $\mathbb{C}$ is a field, $i^2=-1$, $\tau : \mathbb{R} \longrightarrow \mathbb{C}$ has the two desired property.

$3+7i = (3,0) + (7,0)\cdot(0,1)$

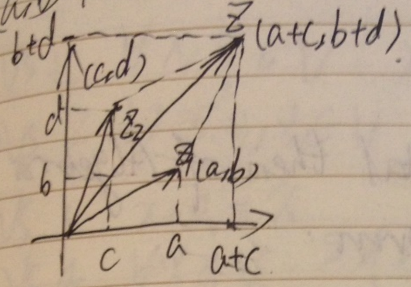
$= (3,0) + (7\cdot 0 - 0\cdot 1,\ 7\cdot 1 + 0\cdot 0)$

$= (3,0) + (0,7) = (3,7)$

$a+bi \leftrightarrow (a,b) \leftrightarrow$



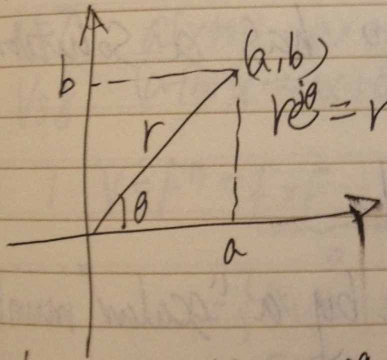
$(a,b)+(c,d)=(a+c,b+d)$



9.22

$(a,b)\neq 0 \Leftrightarrow a\neq 0 \vee (b\neq 0) \Leftrightarrow a^2+b^2>0.$

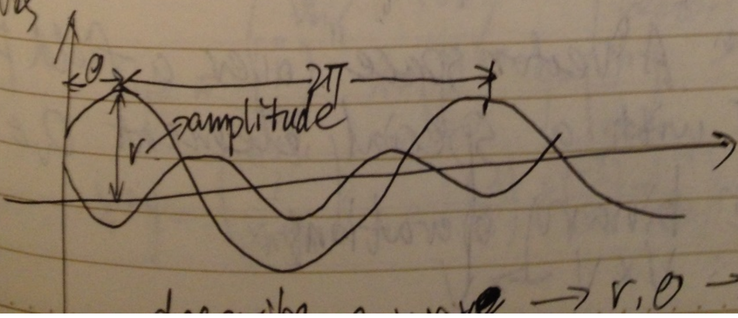
polar coordinates



$re^{i\theta}=r(\cos\theta+i\sin\theta)$

claim $r_1e^{i\theta_1}\cdot r_2e^{i\theta_2}=r_1r_2e^{i(\theta_1+\theta_2)}$

waves



describe a wave $\rightarrow r,\theta \rightarrow re^{i\theta}$

Ohm's Law

$V = R \cdot I$

Thm "The fundamental them of Algebra"

Any equ of the form:

$a_n z^n + a_{n-1} z^{n-1} + \cdots + a_0 = 0$

When $a_i \in \mathbb{C}$ and $a_n \neq 0$ has a solution $z \in \mathbb{C}$

In particular $z^2 + 1 = 0$ has a solution

Forces can be added

can multiply force by a "scalar" number

No "multiplication" of forces

Definition A "vector space" over a field F is a set V with a special element $0_V \in V$ and two binary operations:

$+ : V \times V \to V$

$\times : F \times V \to V$.