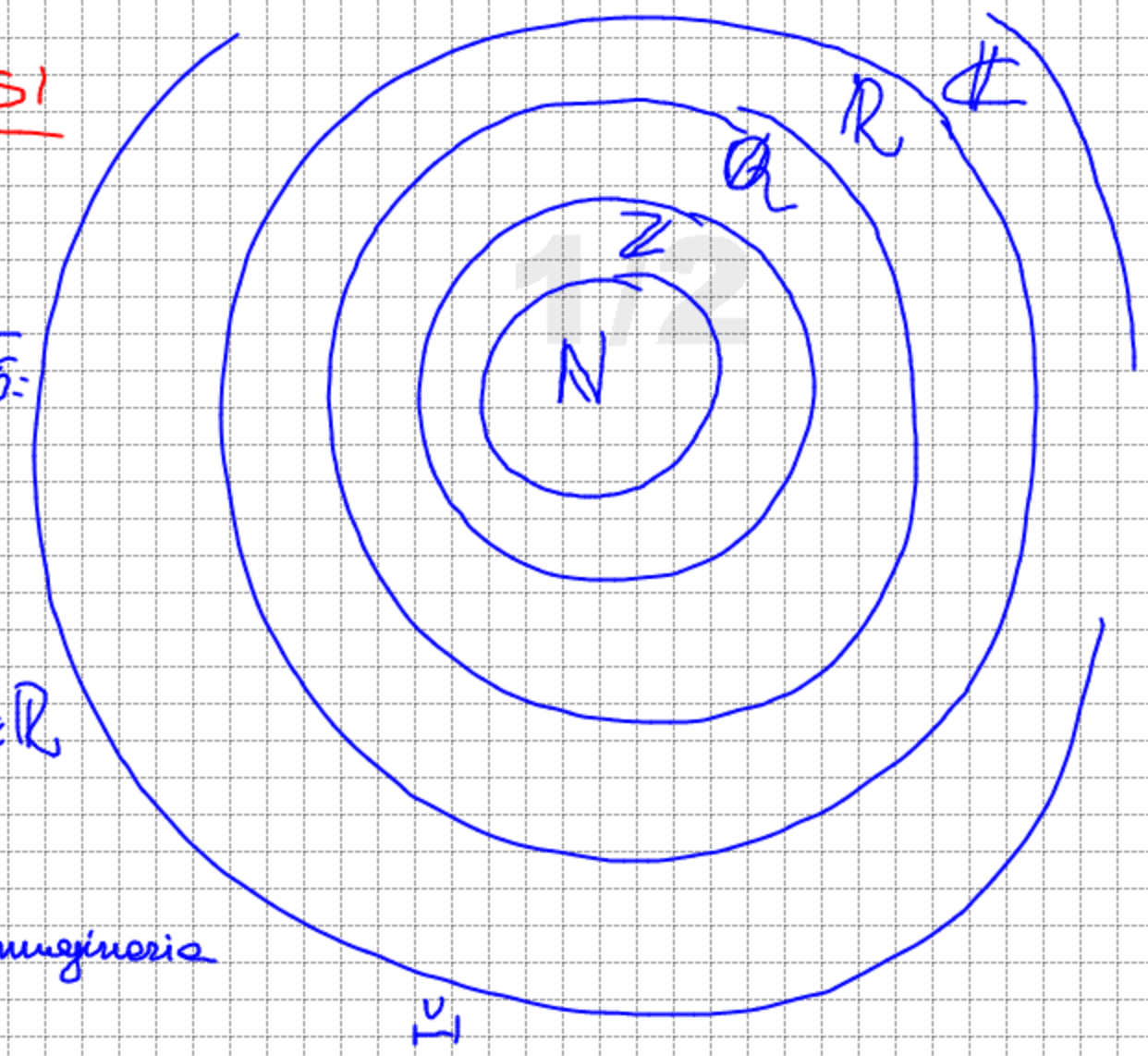
I NUMERI COMPLESSI



$$x^2 + 5 = 0$$

$$x = \pm\sqrt{-5} = \pm\sqrt{-1}\sqrt{5} = \pm\sqrt{5}\,i$$

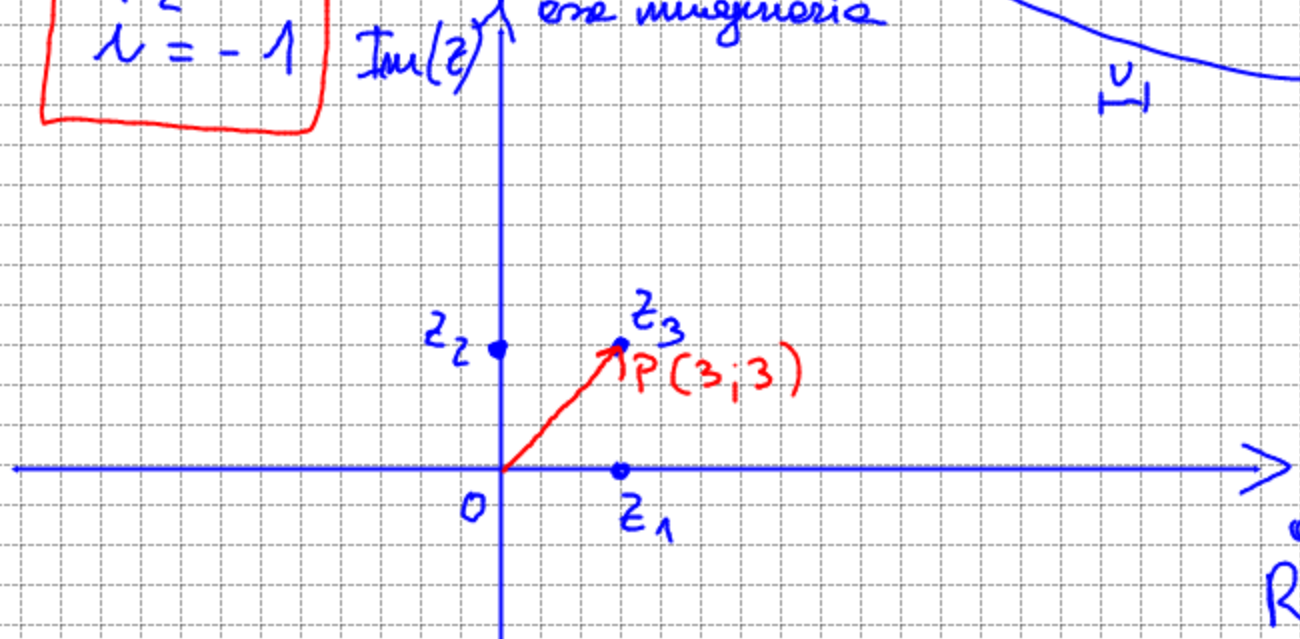
numero complesso

$$z = a + ib$$

$a = Re(z)$ $\quad a, b \in \mathbb{R}$

$b = Im(z)$

$$\boxed{i^2 = -1}$$



$z_1 = 3$

$z_2 = 3i$

$z_3 = 3 + 3i$

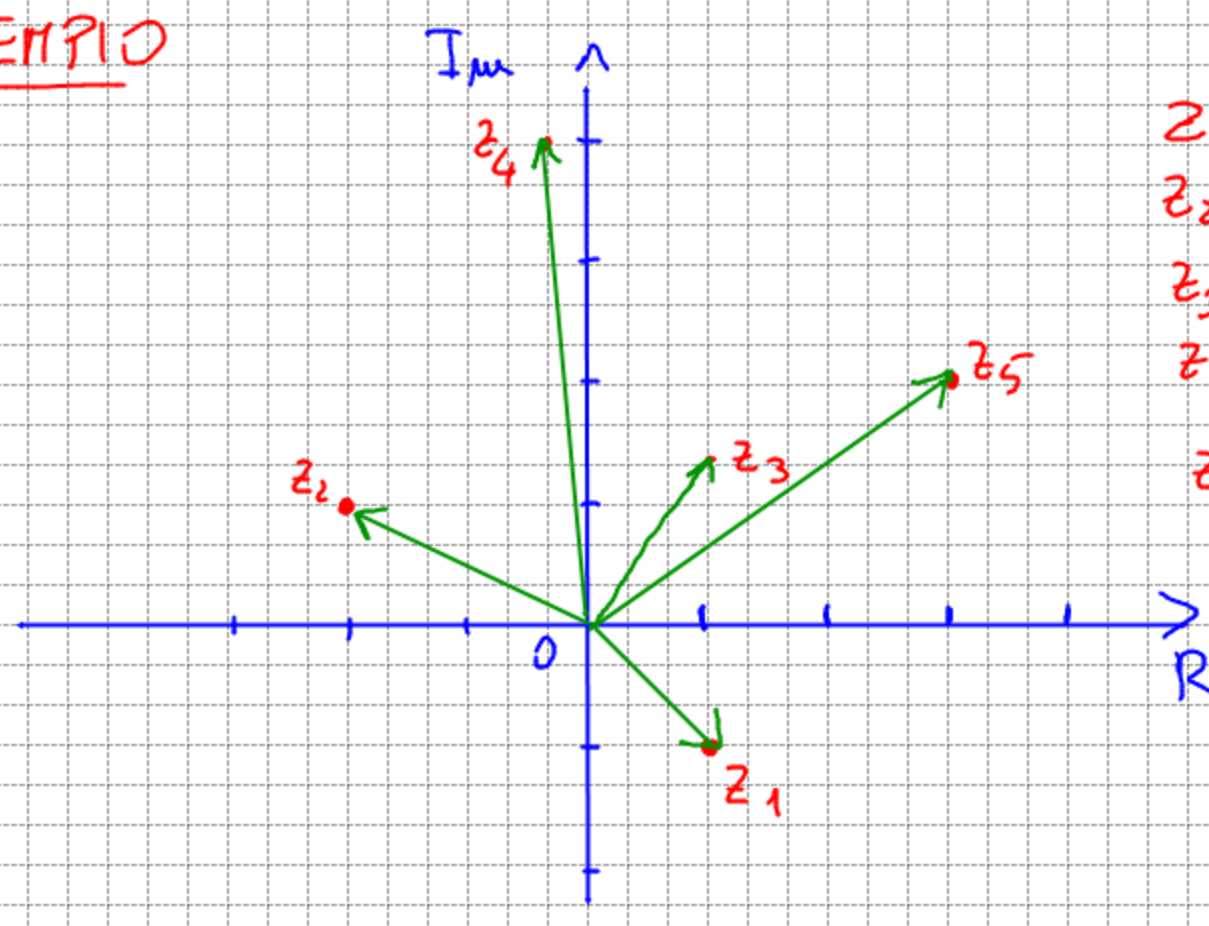
$Re(z_3) = 3$

i numeri reali del tipo $a+ib \iff b=0$

i numeri complessi del tipo $a+ib \iff b \neq 0$ e saranno sull'asse immaginario $\iff a=0$

si chiama MODULO di $z = a+ib \Rightarrow |z| = \sqrt{a^2+b^2}$

ESEMPIO



$z_1 = 1 - i$

$z_2 = -2 + i$

$z_3 = 1 + i\sqrt{2}$

$z_4 = -\frac{1}{3} + 4i$

$z_5 = 3 + 2i$

Def:

I numeri complessi $\boxed{z = a+ib}$ e $\boxed{\bar{z} = a-ib}$ si dicono COMPLESSI CONIUGATI

OSS

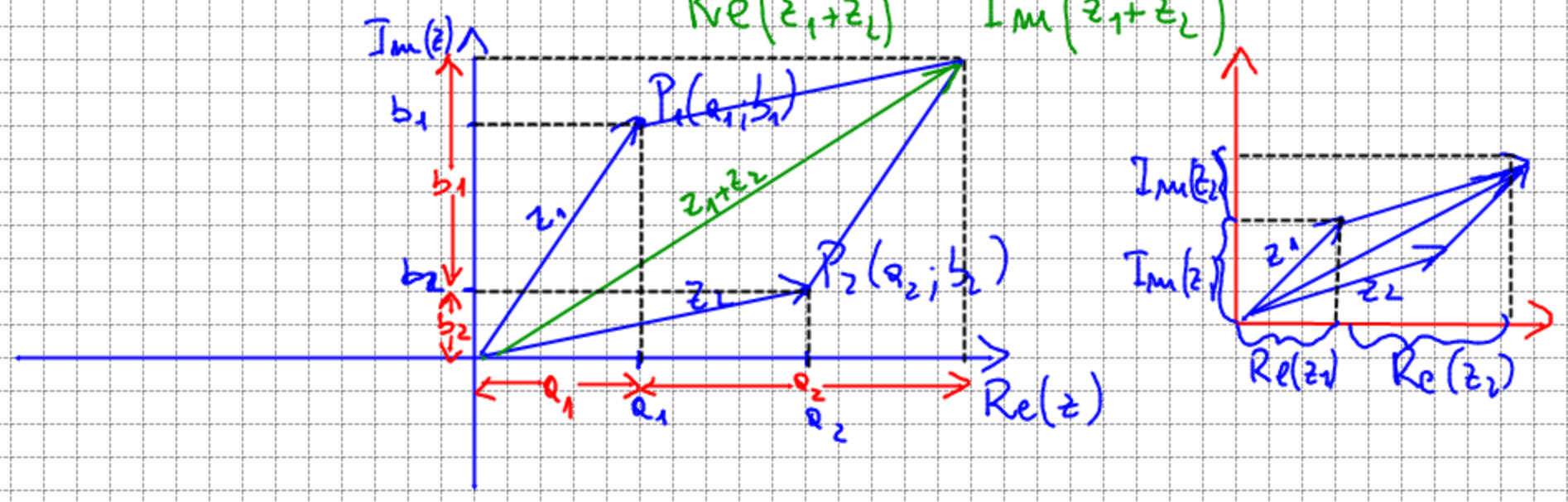
$$z = \bar{z} \iff b = 0$$

OPERAZIONI CON I NUMERI COMPLESSI

SOMMA

Dati due numeri complessi $z_1 = a_1 + ib_1$, $z_2 = a_2 + ib_2$

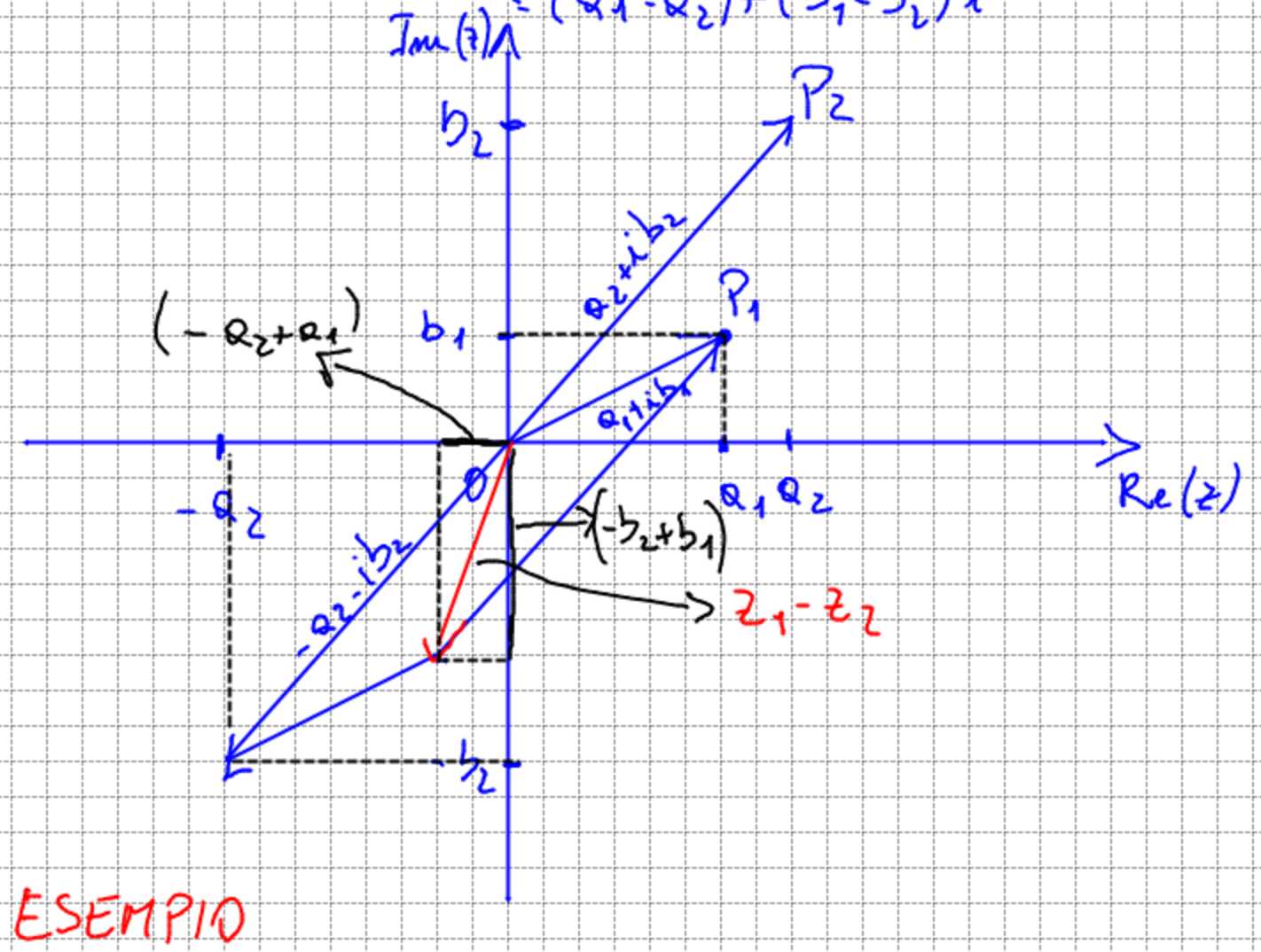
$$z_1 + z_2 = (a_1 + ib_1) + (a_2 + ib_2) =$$
$$= \underbrace{(a_1 + a_2)}_{Re(z_1+z_2)} + i \underbrace{(b_1 + b_2)}_{Im(z_1+z_2)}$$



DIFFERENZA

Dati due numeri complessi $z_1 = a_1 + ib_1$, $z_2 = a_2 + ib_2$

$$z_1 - z_2 = (a_1 + ib_1) - (a_2 + ib_2) = a_1 + ib_1 + (-a_2 - ib_2)$$
$$= (a_1 - a_2) + i(b_1 - b_2) =$$
$$= (a_1 - a_2) + (b_1 - b_2)i$$



ESEMPIO

$z_1 = 2 + 3i$; $z_2 = 4 - 2i$

$z_1 + z_2 = 6 + 1i$

$z_1 - z_2 = -2 + 5i$

$z_2 - z_1 = 2 - 5i$

$\overline{z_1} = 2 - 3i$

$\overline{z_2} = 4 + 2i$

$z_1 + \overline{z_1} = 4$ *

$z_2 + \overline{z_2} = 8$ *

$z_1 + \overline{z_2} = 6 + 5i$

$z_2 + \overline{z_1} = 6 - 5i$

$\overline{z_1} = z_1 = 2 + 3i$

$\overline{z_1} + \overline{z_2} = 6 - i$

$z_1 + z_2 = ?$

$z_1 - z_2 = ?$ $\quad z_2 - z_1 = ?$

$\frac{z_1}{z_2} = ?$

$z_1 + \overline{z_1} = ?$

$z_2 + \overline{z_2} = ?$

$z_1 + \overline{z_2} = ?$

$\overline{z_1} + \overline{z_2} = ?$

$\overline{z_1 + z_2} = ?$

$\overline{z_1} = ?$

Disegnarli!