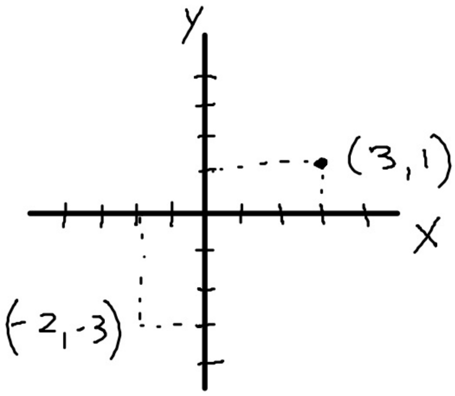
NOMBRES COMPLEXOS o IMAGINARIS

$$x^2 + 1 = 0 \Rightarrow x^2 = -1 \Rightarrow x = \pm\sqrt{-1}$$

$$= \pm i$$

$i = \sqrt{-1} =$ nombre imaginari

així, les solucions de l'equació anterior serien $\pm i$

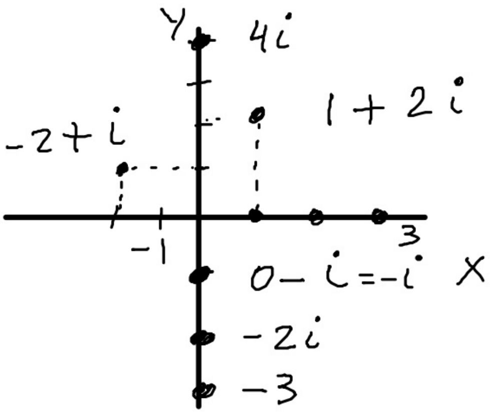


$a + bi \qquad a, b \in \mathbb{R}$

$3 + i = (3,1)$

$-2 - 3i = (-2,-3)$

$5 = 5 + 0 \cdot i$



$i^2 = -1$

$a + bi =$
$= (a, b)$

eix x = eix real

5, 3, −2, 4,

eix y = eix imaginari

S MA i RESTA de NOMBRES COMPLEXOS

$z_1 = 2 + 3i$

$z_2 = 2 + 5i$

$z_1 + z_2 = 2 + 3i + 2 + 5i = 4 + 8i$

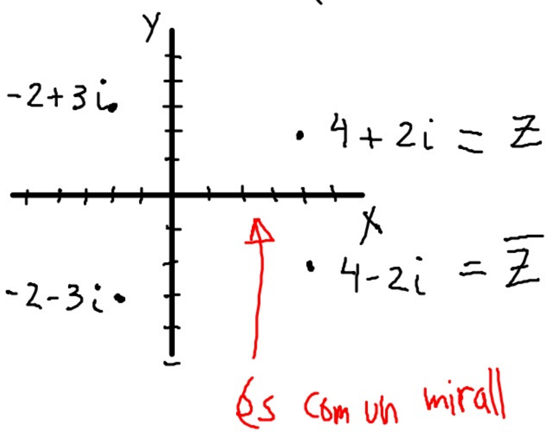
$z_1 - z_2 = 2 + 3i - (2 + 5i) = 0 - 2i$

MULTIPLICACIÓ

$z_1 = 2+3i$
$z_2 = 2+5i$

$$z_1 \cdot z_2 = (2+3i)\cdot(2+5i) =$$
$$= 4 + 10i + 6i + 15\underbrace{i^2}_{-1} =$$
$$= 4 + 16i - 15 = -11 + 16i$$

Calcula $(3-i)(2i+6) = 6i + 18 - 2\underbrace{i^2}_{-1} - 6i$
$= 20$



z i $\bar{z}$ són conjugats

EXEMPLES

$z = -\frac{7}{3} + \sqrt{2}\,i \qquad w = \frac{1}{\sqrt{5}} + \frac{1}{7}i$

$\bar{z} = -\frac{7}{3} - \sqrt{2}\,i \qquad \bar{w} = \frac{1}{\sqrt{5}} - \frac{1}{7}i$

divisió

$$(a+b)\cdot(a-b) = a^2 - b^2$$

$$\frac{2-3i}{3+4i}\cdot\frac{3-4i}{3-4i} = \frac{(2-3i)\cdot(3-4i)}{(3+4i)(3-4i)} = \frac{6-8i-9i-12}{3^2-(4i)^2}$$

(a = 3, b = 4i)

$$= \frac{-6-17i}{9-16\cdot(-1)} = \frac{-6-17i}{9+16} = \frac{-6+17i}{25} = \frac{-6}{25}+\frac{17}{25}i$$

Recordatori

$$\frac{1}{\sqrt{2}}\cdot\frac{\sqrt{2}}{\sqrt{2}} = \ldots$$

$$\frac{1}{1-\sqrt{2}}\cdot\frac{1+\sqrt{2}}{1+\sqrt{2}}$$

ⓐ $\frac{1+2i}{1-3i} = \frac{(1+2i)\cdot(1+3i)}{(1-3i)\cdot(1+3i)} = \frac{1+3i+2i-6}{1+9} =$

$= \frac{-5+5i}{10} = -\frac{1}{2}+\frac{1}{2}i$

ⓑ $\frac{2+2i}{3+3i} =$

$= \frac{2\cdot(1+i)}{3\cdot(1+i)} = \frac{2}{3}$