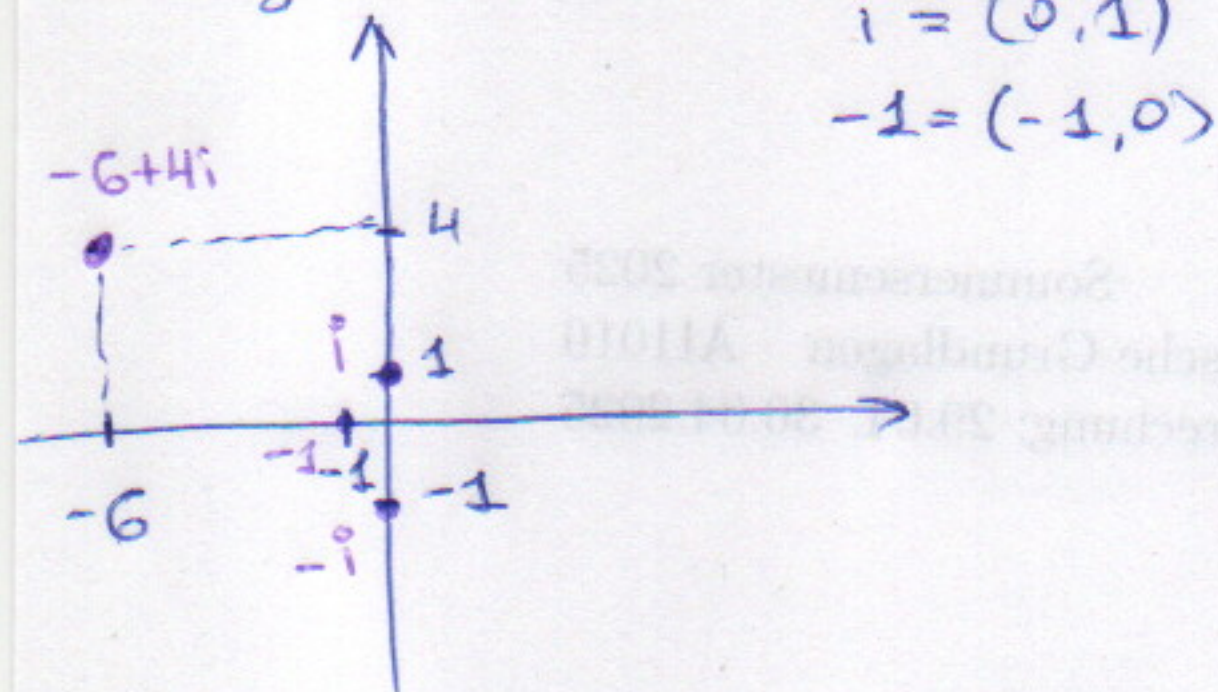


# Aufgabe 1.



$$i = (0,1)$$

$$-1 = (-1,0)$$

- a)  $\text{Re}(-6+4i) = -6$  e)  $\text{Re}(-i) = 0$   
 b)  $\text{Im}(-6+4i) = 4$  f)  $\text{Im}(-i) = -1$   
 c)  $\text{Re}(i) = 0$  g)  $\text{Re}(-1) = -1$   
 d)  $\text{Im}(i) = 1$  h)  $\text{Im}(-1) = 0$

## Aufgabe 2

$$z_1 = \sqrt{3} - i$$

$$z_2 = -2\sqrt{3} + 2i$$

$$\bar{z}_1 = \sqrt{3} + i$$

$$\bar{z}_2 = -2\sqrt{3} - 2i$$

$$b) |z_1| = \sqrt{x^2 + y^2} = \sqrt{(\sqrt{3})^2 + (-1)^2} = \sqrt{3+1} = \sqrt{4} = 2$$

$$|z_2| = \sqrt{x^2 + y^2} = \sqrt{(-2\sqrt{3})^2 + (2)^2} = \sqrt{12 + 4} = \sqrt{16} = 4$$

$$c) z_1 + z_2 = \sqrt{3} - i + 2i - 2\sqrt{3} = -\sqrt{3} + i$$

$$d) z_1 - z_2 = \sqrt{3} - i + 2\sqrt{3} - 2i = 3\sqrt{3} - 3i = 3z_1$$

$$e) z_1 \cdot z_2 = (\sqrt{3} - i)(-2\sqrt{3} + 2i) = -6 + 2\sqrt{3}i + 2\sqrt{3}i - 2i^2 =$$

$$= -6 + 4\sqrt{3}i + 2 = -4(1 - \sqrt{3}i)$$

$$f) \frac{z_1}{z_2} = \frac{\sqrt{3} - i}{-2\sqrt{3} + 2i} = \frac{z_1 \cdot \bar{z}_2}{|z_2|^2} = \frac{(\sqrt{3} - i)(-2\sqrt{3} - 2i)}{(2\sqrt{3})^2 + 2^2} = \frac{-6 + 2\sqrt{3}i - 2\sqrt{3}i + 2i^2}{16} =$$

$$= \frac{-8}{16} = -\frac{1}{2}$$

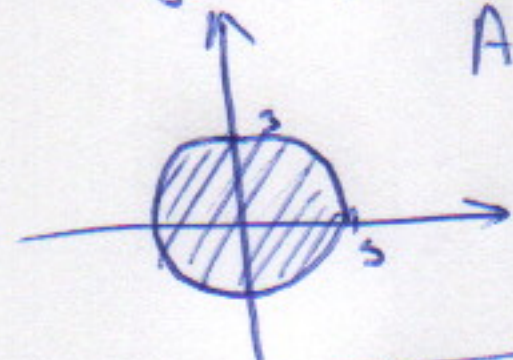
## Aufgabe 3.

a)  $(3-2i)(2+4i) = 6 + 12i - 4i - 8i^2 = 14 + 8i$

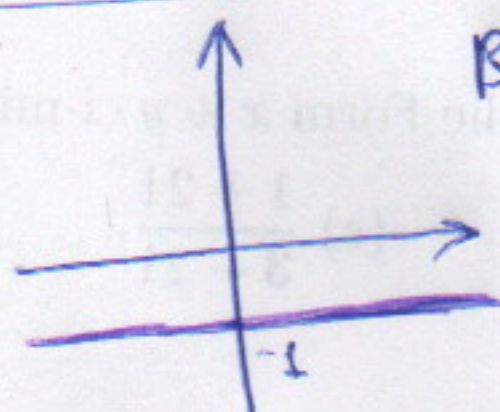
b)  $\frac{1}{i} = \frac{1 \cdot (-i)}{1 \cdot (-i)} = -i$  c)  $\frac{1+2i}{3-2i} = \frac{(1+2i)(3+2i)}{9+4} = \frac{3+2i+6i+4i^2}{13} = \frac{8i-1}{13} =$

$$= -\frac{1}{13} + \frac{8i}{13}$$

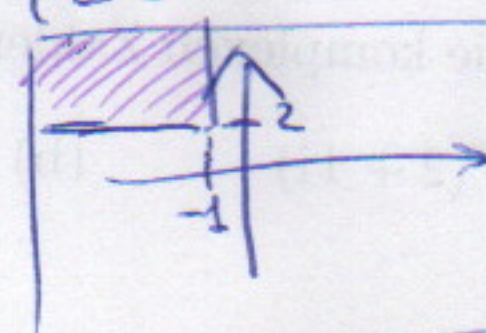
## Aufgabe 4.



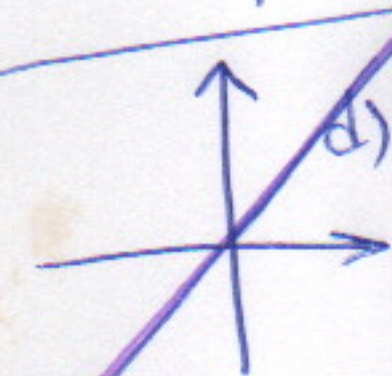
$$A := \{z \in \mathbb{C} : |z| \leq 3\}$$



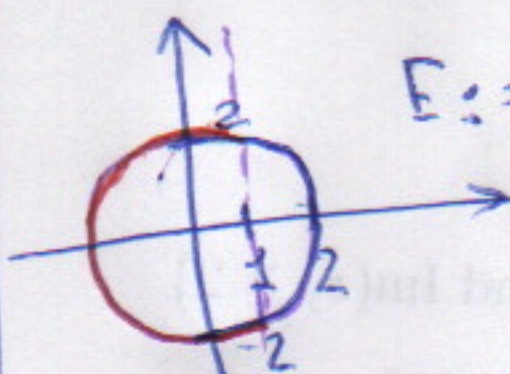
$$B := \{z \in \mathbb{C} : \text{Im}(z) = -1\}$$



$$C := \{z \in \mathbb{C} : \text{Re}(z) > 0 \text{ und } \text{Im}(z) > 0\}$$



$$d) D := \{z \in \mathbb{C} : \text{Re}(z) - \text{Im}(z) = 0\}$$



$$E := \{z \in \mathbb{C} : \text{Re}(z) < 1 \text{ und } |z| = 2\}$$

## Aufgabe 5.

a)  $|z|^2 = z \cdot \bar{z}$ . l.S:  $|z|^2 = (\sqrt{x^2 + y^2})^2 = x^2 + y^2$ . r.S:  $z \cdot \bar{z} = (x+iy)(x-iy) = x^2 - i^2 y^2 = x^2 + y^2$

b)  $\overline{z+w} = \bar{z} + \bar{w}$ . l.S:  $x_1 + x_2 + i(y_1 + y_2) = x_1 + x_2 - i(y_1 + y_2)$

r.S:  $x_1 - iy_1 + x_2 - iy_2 = x_1 + x_2 - i(y_1 + y_2)$ . c)  $\overline{z \cdot w} = \bar{z} \cdot \bar{w}$

l.S:  $(x_1 + iy_1)(x_2 + iy_2) = x_1 x_2 + i x_1 y_2 + i x_2 y_1 - y_1 y_2 = x_1 x_2 - y_1 y_2 - i(x_1 y_2 + x_2 y_1)$

r.S:  $(x_1 - iy_1)(x_2 - iy_2) = x_1 x_2 - i x_1 y_2 - i x_2 y_1 + i^2 y_1 y_2 =$