

# Mathematische Grundlagen

## Übungsblatt 2 – Lösungen

1.

2. Es sei  $z_1 = 4 + 7i$ ,  $z_2 = 3 - 9i$ . Berechnen Sie

(a)  $7 - 2i$  und  $1 + 16i$

(b)  $75 - 15i$

(c)  $-33 + 56i$  und  $-702 + 486i$

(d)  $\sqrt{65} = 8.0622577\dots$  und  $\sqrt{90} = 9.486833\dots$

$$(e) \frac{(4 + 7i)(3 + 9i)}{|3 - 9i|^2} = \frac{-51 + 57i}{90} = -17/30 + 19/30 i$$

$$= -0.5666667 + 0.63333333i$$

3.

$$\frac{x + iy}{1 + 2x + 2iy} = \frac{(x + iy)(1 + 2x - 2iy)}{(1 + 2x)^2 + 4y^2}$$

$$= \frac{[x(1 + 2x) + 2y^2] + [y(1 + 2x) - 2xy]i}{(1 + 2x)^2 + 4y^2}$$

$$= \frac{[x(1 + 2x) + 2y^2] + iy}{(1 + 2x)^2 + 4y^2}$$

4.

$$u = a + bi \quad v = c + di$$

$$\Rightarrow uv = (ac - bd) + (ad + bc)i$$

$$u^*v^* = (ac - bd) - (ad + bc)i = (uv)^*$$

$$|uv|^2 = (ac - bd)^2 + (ad + bc)^2$$

$$= a^2c^2 + b^2d^2 + a^2d^2 + b^2c^2$$

$$= (a^2 + b^2)(c^2 + d^2)$$

$$= |u|^2|v|^2$$