

Hü 7 Stefan Fürst 2BHIT

6.21 a)
6.22 a), b)

6.23 a) a) e) g)

b) $\frac{(13-11j)^*}{1-3j}$

$$\frac{13+11j}{1-3j} \cdot \frac{1+3j}{1+3j}$$

$$\frac{13+39j+11j+33}{1-3j+3j+9}$$

$$\frac{46+50j}{10}$$

$$4.6 + 5j$$

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6.21 a) $\frac{6+2j}{2} \cdot \frac{2(3+j)}{2} \cdot \frac{3+j}{2}$

6.22 a) $\frac{5+j}{1+2j} \cdot \frac{1-2j}{1-2j} = \frac{8-16j+j-2j^2}{1-2j+2j-4j^2}$

$$\frac{8-16j+j-2j^2}{1-2j+2j-4j^2} = \frac{8-15j+2}{1-4j^2} = \frac{10-15j}{5} = 2-3j$$

$$\frac{8-15j+2}{5} = \frac{10-15j}{5} = 2-3j$$

$$\frac{13+39j+11j-33}{1+3j-3j+9} = \frac{-20+50j}{10} = -2+5j$$

$$(1+2j)(1-3j) = \sqrt{1^2+2^2} \cdot \sqrt{1^2+(-3)^2} = \sqrt{5} \cdot \sqrt{10}$$

$$= \sqrt{10 \cdot 5} = 5\sqrt{2}$$

e) $\left| \frac{(1-2j)^2}{1+3j} \right| = \frac{|(1-2j)^2|}{|1+3j|} = \frac{|(1-2j)(1-2j)|}{|1+3j|} = \frac{\sqrt{1+4} \cdot \sqrt{1+4}}{\sqrt{1+9}} =$

$$= \frac{\sqrt{5} \cdot \sqrt{5}}{\sqrt{10}} = \frac{\sqrt{25}}{\sqrt{10}} = \frac{5}{\sqrt{10}} = \frac{\sqrt{5}}{\sqrt{2}} = \frac{\sqrt{10}}{2}$$

d) $\frac{1-2j}{1+2j} \cdot \frac{1-2j}{1-2j} \cdot \frac{1+3j}{1+3j} \cdot \frac{1+3j-2j+6}{1+3j-3j+9} \cdot \frac{7+j}{10}$

$$\frac{1-2j}{1+2j} \cdot \frac{1-2j}{1-2j} \cdot \frac{1+3j}{1+3j} \cdot \frac{1+3j-2j+6}{1+3j-3j+9} \cdot \frac{7+j}{10}$$

$$\frac{1-2j}{1+2j} \cdot \frac{1-2j}{1-2j} \cdot \frac{1+3j}{1+3j} \cdot \frac{1+3j-2j+6}{1+3j-3j+9} \cdot \frac{7+j}{10}$$

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6.23g)

$$d) \frac{1-2j}{1-3j} \cdot \frac{\sqrt{1+4}}{\sqrt{1+9}} \cdot \frac{\sqrt{5}}{\sqrt{10}} = \frac{\sqrt{5}}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \frac{\sqrt{50}}{10}$$

$$\begin{aligned}\frac{(3-2j)^3}{3+2j} &= (3-2j) * (3-2j)^2 = (3-2j) * (5-12j) = 15 - 36j - 10j - 24 = -9 - 46j = \\ \frac{(3-2j)^3}{3+2j} &= \frac{(3-2j)^3}{\sqrt{3^2+2^2}} = \frac{(3-2j)^3}{\sqrt{13}} = \frac{9-46j}{\sqrt{13}} = \frac{\sqrt{9^2+46^2}}{\sqrt{13}} = \frac{\sqrt{2197}}{\sqrt{13}} = \frac{13 * \sqrt{13}}{\sqrt{13}} * \frac{\sqrt{13}}{\sqrt{13}} \\ &= \frac{13 * \sqrt{13} * \sqrt{13}}{13} = \frac{169}{13} = 13\end{aligned}$$

6.25)

checke das Beispiel nicht -1 ist erklärt -2 und -4 kann man ja ausrechnen aber 3 und die anderen ungeraden verstehe ich nicht

$$j^{-n}$$

$$n = 1$$

$$j^{-1} = \frac{1}{j} = \frac{1}{j} * \frac{-j}{-j} = \frac{-j}{j * (-j)} \rightarrow j * j = j^2 = -1 = \frac{-j}{-(-1)} = \frac{-j}{1} | * 1 = -j$$

$$n = 2$$

$$j^{-2} = \frac{1}{j^2} = \frac{1}{-1} = -1$$

$$n = 3$$

$$j^{-3} = \frac{1}{j^3} = \frac{1}{j^3} * \frac{-j^3}{-j^3} = -\frac{j^3}{j^3} = -\frac{j}{j^3}$$

$$n = 4$$

$$j^{-4} = \frac{1}{j^4} = \frac{1}{(j^2)^2} = \frac{1}{(-1)^2} = \frac{1}{1} = 1$$

6.27a)

$$\operatorname{Re} z = 4$$

$$|z| = 5$$

$$z = 4 + ?$$

$$\sqrt{4^2 + x^2} = 5$$

$$\sqrt{16 + x^2} = 5 |^2$$

$$16 + x^2 = 25$$

$$x^2 = 9 | \sqrt{}$$

$$x = \pm 3$$

$$z = 4 + 3j$$

$$z = 4 - 3j$$

6.27d)

$$\operatorname{Re} z = -3$$

$$|z| = 5$$

$$z = -3 + ?$$

$$\sqrt{(-3)^2 + x^2} = 5$$

$$\sqrt{9 + x^2} = 5$$

$$9 + x^2 = 25$$

$$x^2 = 16$$

$$x = \pm 4$$

$$z = -3 + 4j$$

$$z = -3 - 4j$$

6.278)

$$x^2 - 4x + 5 = 0$$

$$x^2 - 4x = -5$$

$$x^2 - 4x + 4 = -1$$

$$(x - 2)^2 = -1$$

$$x = 2 + j$$

$$x = 2 - j$$

6.28b)

$$\frac{1}{2} x^2 - x + 2 = 0$$

$$x^2 - 2x + 4 = 0$$

$$x^2 - 2x = -4$$

$$x^2 - 2x + 1 = -3$$

$$(x - 1)^2 = -3$$

$$x = 1 + i\sqrt{3}$$

$$x = 1 - i\sqrt{3}$$