

MPN Blatt 1 Musterlösung

PG 1.1

$$a) i) \frac{1}{(x-1)} - \frac{(1+x)}{(x^2-1)} = \frac{(1+x)}{(x-1)(x+1)} - \frac{(1+x)}{(x^2-1)} = \frac{(1+x)}{(x^2-1)} - \frac{(1+x)}{(x^2-1)} = \underline{0}$$

$$ii) \frac{(1-a^2)}{(a-1)} = \frac{(1-a^2)}{(a-1)} \cdot \frac{(a+1)}{(a+1)} = \frac{(1-a)(1+a)}{(1-a)^2} = \frac{(1+a)}{(1-a)}$$

$$b) i) \log_3\left(\frac{1}{3}\right) + \log_5(\sqrt{5}) = \log_3(3^{-1}) + \log_5(5^{\frac{1}{2}}) = -1 + \frac{1}{2} = \underline{-\frac{1}{2}}$$

$$ii) \log_2(8) \cdot \log_8(2) = \log_2(2^3) \cdot \log_8(8^{\frac{1}{3}}) = 3 \cdot \frac{1}{3} = \underline{1}$$

$$iii) \frac{(3^{-3})^3}{(-9)^{-5}} = \frac{3^{-9}}{(-9)^{-5}} = \frac{(-9)^5}{3^9} = -1 \cdot \frac{9^5}{3^9} = -1 \cdot \frac{(3^2)^5}{3^9} = -1 \cdot \frac{3^{10}}{3^9} = -1 \cdot 3 = \underline{-3}$$

PG 1.2

$$a) 2i - (1+i)(2-3i) - 2 = 2i - (2-3i+2i-3i^2) - 2 = 2i - 2 + 3i - 2i + 3i^2 - 2 = 3i - 4 + 3 \cdot (-1) = \underline{3i - 7}$$

$$b) (-i)^2 = (-1) \cdot (-1) \cdot i^2 = (-1)^2 \cdot (-1) = \underline{-1}$$

$$c) i^3 = (-1) \cdot i = \underline{-i}$$

$$d) \frac{1}{i} = \frac{i}{i \cdot i} = \frac{i}{i^2} = \underline{-i}$$

$$e) \frac{2i}{(-2+2i)(-1+i)} = \frac{i}{(-1+i)(-1-i)} = \frac{(1-i)}{(1-i^2)} = \frac{(1-i)}{2} = \underline{-\frac{1}{2}i + \frac{1}{2}}$$

$$f) \frac{(1-i)}{(1+2i)} = \frac{(1-i)(1-2i)}{(1+2i)(1-2i)} = \frac{1-2i-i+2i^2}{1+4} = \frac{-3i-1}{5} = \underline{-\frac{3}{5}i - \frac{1}{5}}$$

$$g) (2+i)(2-i) = 2^2 - i^2 = 4 - (-1) = \underline{5}$$

$$h) (1-i)^2 = 1^2 - 2i + i^2 = \underline{-2i}$$

PG 1.3

a) Gesucht: $[H^+]$ in reinem H_2O

$$pH = -\log_{10}([H^+]) \quad | (-1)$$

$$\log_{10}([H^+]) = -pH \quad | 10^{\wedge}$$

$$[H^+] = 10^{-pH} = 10^{-7} \frac{\text{mol}}{\text{l}}$$

$$b) pH_1 = -\log_{10}\left(10^{-7,5} \frac{\text{mol}}{\text{l}}\right) = \underline{7,5}$$

$$pH_2 = -\log_{10}\left(10^{-7,3} \frac{\text{mol}}{\text{l}}\right) = \underline{7,3}$$

→ pH von menschlichem Blut zw. 7,3 & 7,5
⇒ leicht alkalisch da > 7