

Lösung A1

- a) $\log\left(\frac{3 \cdot a^2}{4 \cdot \sqrt{b}}\right) = \log(3 \cdot a^2) - \log(4 \cdot b^{\frac{1}{2}})$
 $= \log(3) + 2 \cdot \log(a) - (\log(4) + \frac{1}{2} \cdot \log(b))$
- b) $\log\left(\frac{x^2 y}{z^5}\right) = \log(x^2 y) - \log(z^5)$
 $= 2 \log(x) + \log(y) - 5 \cdot \log(z)$
- c) $\log\left(\sqrt{\frac{3 \cdot a^3 b}{5 \cdot c^5}}\right) = \log\left(\frac{(3 \cdot a^3 b)^{\frac{1}{2}}}{(5 \cdot c^5)^{\frac{1}{2}}}\right)$
 $= \frac{1}{2} \cdot (\log(3) + 3 \cdot \log(a) + \log(b)) - \frac{1}{2} \cdot (\log(5) + 5 \cdot \log(c))$
 $= \frac{1}{2} \cdot (\log(3) + 3 \cdot \log(a) + \log(b) - \log(5) - 5 \cdot \log(c))$
- d) $\log((u^3 \cdot v^4)^5) = 5 \cdot (3 \cdot \log(u) + 4 \cdot \log(v))$
- e) $\log(10 \cdot \sqrt[3]{x^5}) = \log(10) + \frac{5}{3} \cdot \log(x)$
- f) $\log\left(\sqrt[3]{\frac{a^2 \cdot b}{c^2 \cdot d^4}}\right) = \frac{1}{3} \cdot (2 \cdot \log(a) + \log(b) - 2 \cdot \log(c) + 4 \cdot \log(d))$
- g) $\log\left(\left(\frac{\sqrt[3]{a \cdot b^2}}{c \cdot \sqrt{d^5}}\right)^{\frac{1}{3}}\right) = \frac{1}{3} \cdot \left(\frac{2}{3} \cdot \log(a) + \log(b) - \log(c) - \frac{5}{2} \cdot \log(d)\right)$
- h) $\log\left(\left(\sqrt[5]{\frac{x^5 \cdot \sqrt{y}}{2^3}}\right)^6\right) = 6 \cdot \frac{1}{5} \cdot \left(5 \cdot \log(x) + \frac{1}{2} \cdot \log(y) - 3 \cdot \log(2)\right)$
 $= \frac{6}{5} \cdot \left(5 \cdot \log(x) + \frac{1}{2} \cdot \log(y) - 3 \cdot \log(2)\right)$
- i) $\log\left(\frac{a^2 \cdot b}{\sqrt{c} \cdot d^3}\right) = \log\left(\frac{a^2 \cdot d^3}{\sqrt{c} \cdot b}\right) = 2 \cdot \log(a) + 3 \log(d) - \frac{1}{2} \cdot \log(c) - \log(b)$
- j) $\log\left(\frac{4 \cdot x^2 \cdot \frac{y}{z}}{\sqrt[3]{\frac{u}{v}}}\right) = \log(4) + 2 \cdot \log(x) + \log(y) - \log(z) - \left(\frac{1}{3} \cdot (\log(u) - \log(v))\right)$
 $= \log(4) + 2 \cdot \log(x) + \log(y) - \log(z) - \frac{1}{3} \log(u) + \frac{1}{3} \log(v)$
- k) $\log\left(\frac{(a+b^2)^2}{\sqrt{a^2-b^2}}\right) = 2 \cdot \log(a+b^2) - \frac{1}{2} \cdot \log(a^2-b^2)$
- l) $\log\left(\left(\frac{x \cdot y}{x+y}\right)^4\right) = 4 \cdot (\log(x) + \log(y) - \log(x+y))$

Lösung A2

- a) $2 \cdot \log(a) + 4 \log(b) - \frac{1}{2} \cdot \log(c) = \log\left(\frac{a^2 \cdot b^4}{\sqrt{c}}\right)$
- b) $\frac{1}{2} \cdot \log(x) - \frac{1}{2} \cdot \log(y) + 2 \cdot \log(z) = \log\left(\frac{\sqrt{x} \cdot z^2}{\sqrt{y}}\right)$
- c) $\frac{1}{2} \cdot \log(x) - \left(\frac{1}{3} \cdot \log(y) + 2 \cdot \log(z)\right) = \log\left(\frac{\sqrt{x}}{\sqrt[3]{y} z^2}\right)$
- d) $3 \cdot (\log(a) - 0,5 \cdot \log(b)) - 2 \cdot \left(\log(c) - \frac{1}{2} \cdot \log(d)\right) = \log\left(\left(\frac{a}{\sqrt{b}}\right)^3 \cdot \frac{1}{\left(\frac{c}{\sqrt{d}}\right)^2}\right)$
 $= \log\left(\left(\frac{a}{\sqrt{b}}\right)^3 \cdot \left(\frac{\sqrt{d}}{c}\right)^2\right) = \log\left(\frac{a^3 \cdot d}{\sqrt{b^3} \cdot c^2}\right)$
- e) $1 - (\log(u) - 2 \log(v)) = \log\left(\frac{10}{u \cdot v}\right)$
- f) $-\frac{2}{3} \log(a) - \frac{3}{2} \log(b) - 1 = -\log(10 \cdot \sqrt[3]{a^2} \cdot \sqrt{b^3})$

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- g) $\frac{1}{2} + \frac{1}{2} \cdot (\log(a) - \frac{1}{2} \log(b)) = \frac{1}{2} \cdot (1 + \log(a) - \log(b)) = \log\left(\sqrt{\frac{10 \cdot a}{b}}\right)$
- h) $\frac{1}{3} \cdot \log(x) + 3 \cdot \log(y) - 2 = \log\left(\frac{\sqrt[3]{x} \cdot y^3}{100}\right)$
- i) $\frac{1}{4} \cdot (2 + \frac{1}{2} \cdot \log(2) - 2 \log(a) - \frac{2}{3} \log(b)) = \log\left(\sqrt[4]{\frac{100 \cdot \sqrt{2}}{a^2 \cdot \sqrt[3]{b^2}}}\right)$
- j) $\frac{1}{4} \log(3) - \frac{1}{2} \cdot (\log(a) - 3 \cdot \log(5) + 1) = \log\left(\frac{10 \cdot \sqrt[4]{3}}{125 \cdot a}\right)$
- k) $\frac{1}{2} \cdot \log(x+y) + 2 \cdot ((\log(x-y) + \log(x))) = \log\left((\sqrt{x+y}) \cdot ((x-y) \cdot x)^2\right)$
 $= \log(x^2 \cdot (x-y)^2 \cdot \sqrt{x+y})$