Aufgabe 14.1

(a) $x^3 = \dfrac{1}{216}$

$x^3 = \left(\dfrac{1}{6}\right)^3$

$x = \dfrac{1}{3}$

(b) $x^6 = \dfrac{1}{64}$

$x^6 = \left(\dfrac{1}{2}\right)^6$

$x = \pm\dfrac{1}{2}$

Aufgabe 14.2

(a) $x^4 = \dfrac{1}{81}$

$x^4 = \left(\dfrac{1}{3}\right)^4$

$x = \pm\dfrac{1}{3}$

(b) $x^5 = -\dfrac{1}{32}$

$x^5 = \left(-\dfrac{1}{2}\right)^5$

$x = -\dfrac{1}{2}$

Aufgabe 14.3

(a) $x^7 = 2^{14}$

$x^7 = \left(2^2\right)^7$

$x = 2^2 = 4$

(b) $x^2 = 5^6$

$x^2 = (5^3)^2$

$x = \pm 5^3 = \pm 125$

Aufgabe 14.4

(a) $x^{-3} = 7^6$

$x^{-3} = \left(7^2\right)^{-3}$

$x = 7^2 = 49$

(b) $x^2 = 11^{-4}$

$x^2 = (11^{-2})^2$

$x = \pm 11^{-2} = \pm\frac{1}{121}$

Aufgabe 14.5

(a) $2^{-x} = 4^3$

$\quad 2^{-x} = 2^6$

$\quad\quad x = -6$

(b) $4^x = 8^{-12}$

$\quad 2^{2x} = 2^{-36}$

$\quad 2x = -36$

$\quad\quad x = -18$

Aufgabe 14.6

(a) $9^x = \dfrac{1}{3^8}$

$\quad 3^{2x} = 3^{-8}$

$\quad 2x = -8$

$\quad\quad x = -4$

(b) $125^{-x} = \dfrac{1}{25^{15}}$

$\quad 5^{-3x} = 25^{-15} = 5^{-30}$

$\quad -3x = -30$

$\quad\quad x = 10$

Aufgabe 14.7

(a) $3^7 \cdot 3^x = 3^{-5}$

$\quad 3^{7+x} = 3^{-5}$

$\quad 7 + x = -5$

$\quad\quad x = -12$

(b) $2^4 : 2^x = 2$

$\quad 2^{4-x} = 2^1$

$\quad 4 - x = 1$

$\quad\quad x = 3$

Aufgabe 14.8

(a) $2^x : 8^3 = 4^{-5}$

$\quad 2^x : 2^9 = 2^{-10}$

$\quad 2^{x-9} = 2^{-10}$

$\quad x - 9 = -10$

$\quad\quad x = -1$

(b) $27^4 \cdot 3^x = 81^5 \cdot 9^x$

$\quad 3^{12} \cdot 3^x = 3^{20} \cdot 3^{2x}$

$\quad 3^{12+x} = 3^{20+2x}$

$\quad 12 + x = 20 + 2x$

$\quad\quad x = -8$