

6.17 Laske ilman laskinta.

CAS

a) $\frac{2^{85}}{4^{41}}$

b) $\frac{3^{14} \cdot 6^{12}}{18^{12}}$

$$a) 4=2^2 \Rightarrow \frac{2^{85}}{4^{41}} = \frac{2^{85}}{(2^2)^{41}} = \frac{2^{85}}{2^{82}} = 2^{85-82} = 2^3 = \underline{\underline{8}}$$

$$b) \frac{3^{14} \cdot (2 \cdot 3)^{12}}{(2 \cdot 3 \cdot 3)^{12}} = \frac{3^{14} \cdot 2^{12} \cdot 3^{12}}{2^{12} \cdot 3^{12} \cdot 3^{12}} = \frac{3^{14}}{3^{12}} = 3^{14-12} = 3^2 = \underline{\underline{9}}$$

$$TA1 \frac{3^{14} \cdot 6^{12}}{(3 \cdot 6)^{12}} = \frac{3^{14} \cdot 6^{12}}{3^{12} \cdot 6^{12}} = 3^{14-12} = 3^2 = \underline{\underline{9}}$$

6.18 Sievennä.

CAS

a) $(3x^2)^3 + (-2x^3)^2 = 3^3 \cdot (x^2)^3 + (-2)^2 \cdot (x^3)^2 = 27x^{2 \cdot 3} + 4 \cdot x^{3 \cdot 2} = 27x^6 + 4x^6 = \underline{\underline{31x^6}}$

b) $(-3x^6)^3 + (6x^9 - 4x^9)^2 =$

$$\begin{aligned} (-3)^3 \cdot (x^6)^3 + (2x^9)^2 &= -27x^{18} + 2^2 \cdot (x^9)^2 \\ &= -27x^{18} + 4x^{18} = \underline{\underline{-23x^{18}}} \end{aligned}$$

6.19 Sievennä.

~~CRS~~

a) $\frac{x^{2^3} \cdot (6x^4)^2}{9x \cdot (-x^3)^2}$

b) $\frac{(-4x^3)^2 \cdot (-2x^3)^3}{-32x^7}$

a) $\frac{x^8 \cdot 6^2 \cdot (x^4)^2}{9x \cdot x^6} = \frac{x^8 \cdot 36 \cdot x^8}{9x \cdot x^6} = 4 \cdot x^7 \cdot x^2 = \underline{\underline{4x^9}}$

b) $\frac{(-4)^2 \cdot (x^3)^2 \cdot (-2)^3 \cdot (x^3)^3}{-32x^7} = \frac{16 \cdot x^6 \cdot (-8) \cdot x^9}{-32x^7} = 4 \cdot x^6 \cdot x^2 = \underline{\underline{4x^8}}$

Potenssi a^n

EkspONENTTI n	Määritelmä	Huomautuksia
p ($p \in \mathbb{Z}_+$)	$a^p = \underbrace{a \cdot a \cdot \dots \cdot a}_{p \text{ kpl}}$	a on kantaluku ja p eksponentti.
0	$a^0 = 1$	$a \neq 0$, 0^0 ei määritelty!
$-p$ ($p \in \mathbb{Z}_+$)	$a^{-p} = \frac{1}{a^p}$	$a \neq 0, b \neq 0, \left(\frac{a}{b}\right)^{-p} = \left(\frac{b}{a}\right)^p$

$$7^0 = 1, (-500)^0 = 1, (8x^4)^0 = 1$$

$$\text{Esim. } 2^{-3} = \frac{1}{2^3} = \frac{1}{8}$$

$$\text{TAI } 2^{-3} = \left(\frac{1}{2}\right)^3 = \frac{1^3}{2^3} = \frac{1}{8}$$

$$\text{Esim. } \left(\frac{2x^2}{3}\right)^{-2} = \left(\frac{3}{2x^2}\right)^2 = \frac{3^2}{(2x^2)^2} = \frac{9}{2^2 \cdot (x^2)^2} = \frac{9}{4x^4}$$

Kymmenen potenssit

$$10^{-1} = \frac{1}{10^1} = \frac{1}{10} = 0,1$$

$$\text{Esim. } \underbrace{3,5}_{\text{4}} \cdot \underbrace{10^{-4}}_{\text{4}} \text{ m} = 0,00035 \text{ m}$$

$$10^{-2} = \frac{1}{10^2} = \frac{1}{100} = 0,01$$

$$3,5 \cdot 0,0001$$

$$10^{-3} = \frac{1}{10^3} = \frac{1}{1000} = 0,001$$

$$\text{Esim. } \underbrace{0,00000256}_{\text{6}} \text{ m} = 2,56 \cdot 10^{-6} \text{ m}$$