

LOGARITMIFUNKTIO

esim $3^x = 5$.

$$x = \log_3 5$$

$$a^x = 1 \Leftrightarrow x = \log_a 1$$

$$a^y = x \Leftrightarrow y = \log_a x$$

logaritmifunktio on eksponenttifunktion
käänteisfunktio

s.122 $f(x) = \log_a x \quad (x > 0, a > 0, a \neq 1)$

esim. Pää funktiot
 $a > 1$

a)

$$f(x) = 2^x$$

$$g(x) = \log_2 x$$

↳ aid. kasv.
↳ (1,0)

b) $0 < a < 1$

$$f(x) = \left(\frac{1}{3}\right)^x$$

$$g(x) = \log_{\left(\frac{1}{3}\right)} x$$

↳ aid. väh.
↳ (1,0)

$\log_2 x$ 2-kantainen logaritmi

$\log_3 x$ 3-kantainen logaritmi

$\log_{10} x = \lg$ 10-kantainen - " -
(laskin log) CAS \log

$\log_e x = \ln x$ luonnollinen logaritmi
(laskin ln) e Neperin luku
 $e \approx 2,718\dots$

esim 3 a) $\lg 1000 = \lg 10^3 = \underline{\underline{3}}$

b) $\log_2 1 = \log_2 2^0 = \underline{\underline{0}}$

c) $\log_3 81^{\frac{1}{2}} = \log_3 \sqrt{81} = \log_3 9 = \log_3 3^2 = \underline{\underline{2}}$

d) $\log_3 \sqrt{\sqrt{9}} = \log_3 (9^{\frac{1}{3}})^{\frac{1}{2}} = \log_3 9^{\frac{1}{6}} = \log_3 (3^2)^{\frac{1}{6}} = \log_3 3^{\frac{1}{3}} = \underline{\underline{\frac{1}{3}}}$

$\log_k 1 = 0$, koska $k^0 = 1$

$\log_k k^1 = 1$, koska $k^1 = k$

$$\log_k x \cdot y = \log_k x + \log_k y$$

$$\log_k \frac{x}{y} = \log_k x - \log_k y$$

$$\log_k x^r = r \cdot \log_k x$$

$x, y > 0$

$r \in \mathbb{R}$

esim 5 a) $\log_3 \left(\frac{1}{11} \right) + \log_3 99$

$$= \log_3 \left(\frac{1}{11} \cdot 99 \right) = \log_3 9 = \log_3 3^2 = \underline{\underline{2}}$$

b) $\log_2 160 - \log_2 5$

$$= \log_2 \frac{160}{5} = \log_2 32 = \log_2 2^5 = \underline{\underline{5}}$$