

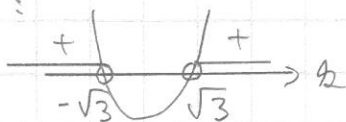
10.13  $f(x) = (x^2 - 2)^x$

Exponenttifunktio  $f$  on aidosti kasvava  $\Leftrightarrow x^2 - 2 > 1$

$\Leftrightarrow x^2 - 3 > 0$

1<sup>o</sup> Vastavaa yllä:  $x^2 - 3 = 0 \Leftrightarrow x^2 = 3 \sqrt{\quad} \Leftrightarrow x = \pm\sqrt{3}$

2<sup>o</sup> Kuvasija:

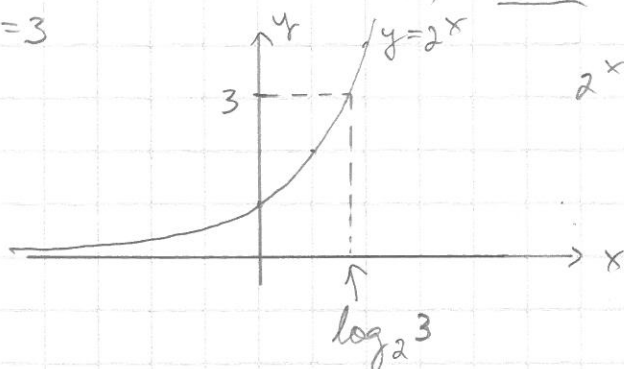


3<sup>o</sup> Vastaus:  $x < -\sqrt{3}$  tai  $x > \sqrt{3}$

## 11. Logaritmifunktio

Esim. a)  $2^x = 8 \Leftrightarrow 2^x = 2^3 \Leftrightarrow x = 3$

b)  $2^x = 3$



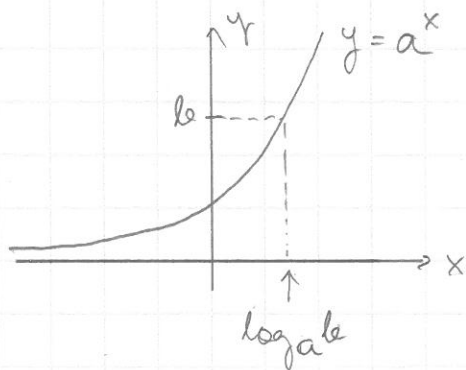
$2^x = 3 \Leftrightarrow x = \log_2 3$

"2-potenssin logaritmi  
lueks 3"

c)  $2^x = -1$   $\downarrow$  ei ratka

> 0 aina ( $2^x$ -funktion kuvaaja on aina x-akselin yläpuolella)

Yleisesti



$a^x = b \Leftrightarrow x = \log_a b$   $a > 0, a \neq 1, b > 0$

(Vrt.  $x^3 = 5 \Leftrightarrow x = \sqrt[3]{5}$ )

Esim. a)  $5^x = 7 \Leftrightarrow x = \log_5 7$  ( $\approx 1,2$ ) ( $\log_5 7 = \frac{\ln 7}{\ln 5} \approx 1,2$ )

b)  $\log_2 8 = 3$  ( $2^3 = 8$ )

c)  $\log_3 9 = 2$  ( $3^2 = 9$ )

d)  $\log_5 1 = 0$  ( $5^0 = 1$ )

e)  $\log_2 \frac{1}{4} = -2$  ( $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$ )

f)  $\log_4 0$  ei määritelly ( $4^x = 0$   $\downarrow$ )  
> 0 aina