

$$\begin{aligned}\underline{427} \quad \ln e^6 &= 6 \\ \ln e^1 &= 1 \\ \ln 1 &= 0 \\ e^{\ln 5} &= 5\end{aligned}$$

$$e^x = 1$$

$$\log_2$$

$$\log_{5,17}$$

$$\log_{10} = \lg$$

$$\ln$$

$$\log_e$$

$$\log_a 1 = 0$$
$$a^0 = 1$$

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

$$\log_a a^1 = 1$$
$$\log_a a^x = x$$
$$a^{\log_a x} = x$$

$$\log_0 \square$$



$$\underline{428} \quad f(t) = 38 - 2e^{-0,6t}$$

$$38,0^\circ\text{C} - 0,1^\circ\text{C} = 37,9^\circ\text{C}$$

$$t = ?$$

$$38 - 2e^{-0,6t} = 37,9$$

$$\text{solve}(38 - 2e^{-0,6t} = 37,9, t)$$

$$-2e^{-0,6t} = -0,1 \quad | : (-2)$$

$$e^{-0,6t} = 0,05$$

$$-0,6t = \ln 0,05 \quad | : (-0,6)$$

$$t = \frac{\ln 0,05}{-0,6}$$

$$\approx 4,993 \dots \approx 5$$

V: Mittaansta tulee jatkua 5 min.

$$b) \quad f(t) = 38 - 2e^{-0,6t}$$

$$f'(t) = 0 - 2e^{-0,6t} \cdot (-0,6)$$

$$\frac{d}{dx} = 1,2e^{-0,6t}$$

$$f'(3) = 1,2 \cdot e^{-0,6 \cdot 3} = 0,198 \dots \approx 0,2$$

$$s(t) = -0,6t$$

$$s'(t) = -0,6$$

V: Muutosnopeus on $0,2^\circ\text{C}/\text{min}$.

LOGARITMIYHTÄLÖ

E1

$$\begin{aligned} \lg x &= 4 \\ \log_{10} x &= 4 \\ 10^4 &= x \\ x &= 10000 \end{aligned}$$

$$\begin{aligned} \lg &= \log_{10} \\ \text{määrittelyehto:} \\ x &> 0 \end{aligned}$$

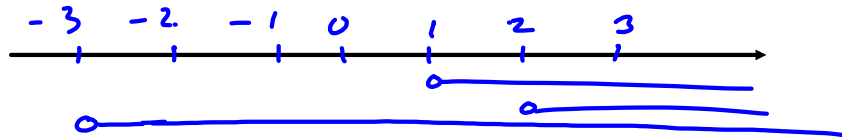
TARKISTUS:

$$\log_{10} 10000 = \log_{10} 10^{\textcircled{4}} = \underline{\underline{4}} \quad \checkmark$$

E2 $\ln(x-1) + \ln(x-2) + \ln(x+3) = \ln 6$

määrittelyehto !

$$\begin{aligned} x-1 > 0 & \text{ ja } x-2 > 0 & \text{ ja } x+3 > 0 \\ x > 1 & \text{ ja } x > 2 & \text{ ja } x > -3 \end{aligned}$$



Me: $x > 2$

$$\ln(x-1) + \ln(x-2) + \ln(x+3) = \ln 6$$

$$\ln((x-1)(x-2)(x+3)) = \ln 6$$

$$(x-1)(x-2)(x+3) = 6$$

$$x^3 - 7x + 6 = 6$$

$$x^3 - 7x + \cancel{6} - \cancel{6} = 0$$

YHT. TEKIJÄ

MMK2

$$x(x^2 - 7) = 0$$

TULON NOLLASÄÄNTÖ

$$\begin{aligned} x &= 0 \\ \text{ei käy} \\ \&\neq \text{ me} \end{aligned}$$

tai

$$\begin{aligned} x^2 - 7 &= 0 \\ x^2 &= 7 \end{aligned}$$

√

$$\begin{aligned} x &= \sqrt{7} \text{ tai } x = -\sqrt{7} \\ &\approx 2,64... \quad \&\neq \text{ me} \\ &\&\neq \text{ me} \end{aligned}$$

√: $x = \sqrt{7}$

TARKISTUS: SIS. $x = \sqrt{7}$ alkuper. yht.