

12.20 $x > 1$

$$\lg(2x+1) - \lg 2x = \lg \frac{2x+1}{2x} = \lg\left(\frac{2x}{2x} + \frac{1}{2x}\right) = \lg\left(1 + \frac{1}{2x}\right)$$

$$\lg(x+1) - \lg x = \lg \frac{x+1}{x} = \lg\left(\frac{x}{x} + \frac{1}{x}\right) = \lg\left(1 + \frac{1}{x}\right)$$

$\frac{1}{x} > \frac{1}{2x}$

$\lg$ on aidohi karsake funktsio (kardaleku $10 > 1$)

$\rightarrow \lg(1 + \frac{1}{x})$ on isompi kuin $\lg(1 + \frac{1}{2x})$ koska

$1 + \frac{1}{x}$ on isompi kuin $1 + \frac{1}{2x}$

Vast. $\lg(x+1) - \lg x$

13. Logaritmitohtola

13.2 a) $\log_8(x+3) = \frac{1}{3}$, $x+3 > 0 \Rightarrow x > -3$

$\Rightarrow 8^{\frac{1}{3}} = x+3 \Rightarrow \sqrt[3]{8} = x+3 \Rightarrow 2 = x+3 \Rightarrow x = -1$ ky

$\Gamma_{TAI}: \log_8(x+3) = \frac{1}{3} \quad | \cdot 8^{(\cdot)}$

$\Rightarrow 8^{\log_8(x+3)} = 8^{\frac{1}{3}} \Rightarrow x+3 = 8^{\frac{1}{3}} \Rightarrow x+3 = 2 \Rightarrow x = -1$

b) $\log_6 4x^2 - 2 = 0$, $x \neq 0$

$\Rightarrow \log_6 4x^2 = 2 \Rightarrow 6^2 = 4x^2 \quad | :4 \Rightarrow x^2 = 9 \quad | \sqrt{} \Rightarrow x = \pm 3$

13.4 a) $\log_6 x = 1 - \log_6(x-5)$, $x > 0$
 $x-5 > 0 \Rightarrow x > 5 \Rightarrow x > 5$

$\Rightarrow \log_6 x + \log_6(x-5) = 1$

$\Rightarrow \log_6(x(x-5)) = 1$

$\Rightarrow 6^1 = x(x-5) \Rightarrow 0 = x^2 - 5x - 6$

$\Rightarrow x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \cdot 1 \cdot (-6)}}{2 \cdot 1} = \frac{5 \pm \sqrt{49}}{2} = \frac{5 \pm 7}{2}$
 $= \begin{cases} 6 \uparrow \\ -1 \downarrow \end{cases}$

Vast. $x = 6$