

## Logaritma

Log --- ~ 10 pangkat berapa hasilnya ----

$$\text{Log } 10 = 10 \text{ pangkat berapa hasilnya } 10 = 1$$

$$\text{Log } 100 = 10 \text{ pangkat berapa hasilnya } 100 = 2$$

$$\text{Log } 1000 = 10 \text{ pangkat berapa hasilnya } 1000 = 3$$

$$\text{Log } 1 = 10 \text{ pangkat berapa hasilnya } 1 = 0$$

$$\text{Log } 0,1 = 10 \text{ pangkat berapa hasilnya } 0,1 = -1$$

$$\text{Log } 1000 = 3$$

$$\text{Log } 100 = 2$$

$$\text{Log } 10 = 1$$

$$\text{Log } 1 = 0$$

$$\text{Log } 0,1 = -1$$

Latihan:

a)  $\text{Log } 1.000.000 =$

b)  $\text{Log } 10.000 =$

c)  $\text{log } 10^3 =$

d)  $\text{Log } 10^{-4} =$

e)  $\text{Log } 0,0001 =$

log bil negatif  
tidak boleh

## Menghitung Log

$$\text{Log } 2 = 0,3010$$

$$10^{0,3010} = 1,9999$$

$$\text{Log } 2 = \text{Log } 10^{0,3010} = 0,3010$$

$$\text{Log } 3 = 0,4771$$

$$10^{0,4771} = 2,9999$$

$$\text{Log } 3 = \text{log } 10^{0,4771} = 0,4771$$

$$\text{Log } 5 = 0,6990$$

$$10^{0,6990} = 5,0003$$

$$\text{Log } 5 = \text{Log } 10^{0,6990} = 0,6990$$

$$\text{Log } x = 2 \rightarrow \text{Log } \underline{x} = \text{Log } \underline{10^2} \Rightarrow x = 10^2$$

$$\text{Log } x = 0,8 \rightarrow \text{Log } x = \text{Log } \underline{10^{0,8}} \Rightarrow x = 6,3096$$

$$\text{Log } x = 3,6 \rightarrow \text{Log } x = \text{Log } \underline{10^{3,6}} \Rightarrow x = 3981,07$$

$$\text{Log } x = 0,604 \rightarrow \text{Log } \underline{x} = \text{Log } \underline{10^{0,604}} \Rightarrow x = \underline{\underline{4,0179}}$$

$$\begin{aligned}\text{Log}(x+50) &= 2 \rightarrow \text{log}(x+50) = \text{Log } 10^2 \\ x+50 &= 100 \\ x &= \underline{\underline{50}}\end{aligned}$$

### Latihan

a)  $\text{Log } 7 = \dots$   $10^{\dots} \approx 7$

b)  $\text{Log } 11 = \dots$   $10^{\dots} \approx 11$

c)  $\text{Log } x = 0,6$   $x = ?$

d)  $\text{Log } x = 1,3$   $x = \dots$

e)  $\text{Log } x = -1,2$   $x = \dots$

f)  $\text{Log}(e+1) = 1$   $e = \dots$

g)  $\text{Log}(d-30) = 2$   $d = ?$

h)  $\text{Log}(e+300) = 3$   $e = ?$

i)  $\text{Log}(2f-300) = 3$   $f = ?$

## Sifat Log

a) penjumlahan

$$\underbrace{\text{Log } 10}_1 + \underbrace{\text{Log } 10}_1 = 2$$

$$\text{Log } 100 = 2$$

$$\boxed{\text{Log } \underline{10} + \text{Log } \underline{10} = \text{Log } \underline{100}}$$

$$\underbrace{\text{Log } 100}_2 + \underbrace{\text{Log } 10}_1 = 3$$

$$\text{Log } 1000 = 3$$

$$\boxed{\text{Log } \underline{100} + \text{Log } \underline{10} = \text{Log } \underline{1000}}$$

$$\boxed{\text{Log } a + \text{Log } b = \text{Log } a \cdot b}$$

b) pengurangan

$$\underbrace{\text{Log } 10}_1 - \underbrace{\text{Log } 10}_1 = 0$$

$$\text{Log } 1 = 0$$

$$\boxed{\text{Log } \underline{10} - \text{Log } \underline{10} = \text{Log } \underline{1}}$$

$$\underbrace{\text{Log } 1000}_3 - \underbrace{\text{Log } 10}_1 = 2$$

$$\text{Log } 100 = 2$$

$$\boxed{\text{Log } \underline{1000} - \text{Log } \underline{10} = \text{Log } \underline{100}}$$

$$\boxed{\text{Log } a - \text{Log } b = \text{Log } \frac{a}{b}}$$

e) pangkat

$$\begin{aligned}\text{Log } 2^3 &= \text{Log } (2 \times 2 \times 2) \\ &= \text{Log } 2 + \text{Log } 2 + \text{Log } 2 \\ &= 3 \text{Log } 2\end{aligned}$$

$$\begin{aligned}\text{Log } 3^4 &= \text{Log } (3 \times 3 \times 3 \times 3) \\ &= \text{Log } 3 + \text{Log } 3 + \text{Log } 3 + \text{Log } 3 \\ &= 4 \text{Log } 3\end{aligned}$$

$$\boxed{\text{Log } a^b = b \text{Log } a}$$

### Latihan

$$\text{Log } 2 = 0,3010$$

$$\text{Log } 3 = 0,4771$$

$$\text{Log } 4 = 0,6020$$

$$\text{Log } 5 = 0,6990$$

$$\text{Log } 6 = 0,7782$$

$$\text{Log } 8 = 0,9031$$

$$\text{Log } 9 = 0,9542$$

$$\text{Log } 12 = 1,0792$$

$$\text{Log } 16 = 1,2041$$

$$\text{Log } 32 = 1,5051$$

$$\text{Log } 64 = 1,8062$$

$$a) \text{Log } 6 = \text{Log } 3 + \text{Log } 2$$

$$b) \text{Log } 12 - \text{Log } 2 = \text{Log } 6$$

$$c) \text{Log } 4 + \text{Log } 4 = \text{Log } 16$$

$$d) \text{Log } 8 + \text{Log } 2 = \text{Log } 16$$

$$e) \text{Log } 32 - \text{Log } 2 = \text{Log } 16$$

$$f) \text{Log } 3^2 = 2 \text{Log } 3$$

$$g) \text{Log } 81 = 2 \text{Log } 9$$

$$h) \text{Log } 81 = 4 \text{Log } 3$$

$$i) \text{Log } 64 = 2 \text{Log } 8$$

$$j) \text{Log } 64 = 6 \text{Log } 2$$

## Memfaatkan Sifat Log

$$\begin{aligned} \text{a) } x &= \frac{\text{Log } 16}{\text{Log } 8} \\ &= \frac{\text{Log } 2^4}{\text{Log } 2^3} \\ &= \frac{4 \text{Log } 2}{3 \text{Log } 2} \\ &= \frac{4}{3} \end{aligned}$$

$$\begin{aligned} \text{b) } x &= \frac{\text{Log } 9}{\text{Log } 3} \times \text{Log } 81 \\ &= \frac{\text{Log } 3^2}{\text{Log } 3^1} \times \text{Log } 3^4 \\ &= \frac{2 \text{Log } 3}{\text{Log } 3} \cdot 4 \text{Log } 3 \\ &= 8 \text{Log } 3 \end{aligned}$$

$$\begin{aligned} \text{c) } \text{Log } 250 + \text{Log } 5 - \text{Log } 25 \\ &= \text{Log } \frac{250 \times 5}{25} \\ &= \text{Log } 50 \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{\text{Log } 32}{\text{Log } 2} \times \text{Log } 64 : \text{Log } 4 \\ &= \frac{\text{Log } 2^5}{\text{Log } 2} \times \frac{\text{Log } 2^6}{\text{Log } 2^2} \\ &= \frac{5 \text{Log } 2}{\text{Log } 2} \times \frac{6 \text{Log } 2}{2 \text{Log } 2} \\ &= 15 \end{aligned}$$

## Latihan

$$\text{a) } a = \frac{\text{Log } 128}{\text{Log } 16}$$

$$\text{b) } y = \frac{\text{Log } 81}{\text{Log } 9}$$

$$\text{c) } z = \text{Log } 30 + \text{Log } 5 - \text{Log } 1$$

$$\text{d) } x = \text{Log } 81 - \text{Log } 3$$

$$\text{e) } x = \frac{\text{Log } 64 - \text{Log } 2}{\text{Log } 32 - \text{Log } 4}$$

## Logaritma basis lain

basis 2 :

$$\underline{\underline{(\text{Log } 8)_{\text{basis } 2}} = \underline{\underline{2 \text{ pangkat berapa hasilnya } 8}}}$$

$$(\text{Log } 8)_{\text{basis } 2} \text{ ditulis } \boxed{{}^2\text{Log } 8}$$

basis 3 :

$$\sqrt[3]{\text{Log } 9} = 3 \text{ pangkat berapa hasilnya } 9$$

basis 4 :

$${}^4\text{Log } 64 = 4 \text{ pangkat berapa hasilnya } 64$$

$${}^8\text{Log } 8 =$$

⋮

catatan

basis 1 tidak boleh

$${}^2 \text{Log } 2 = 1$$

$${}^4 \text{Log } 4 = 1$$

$${}^3 \text{Log } 3 = 1$$

$${}^9 \text{Log } 9 = 1$$

$$\boxed{{}^x \text{Log } x = 1}$$

$$a) {}^2 \text{Log } 8 = {}^2 \text{Log } 2^3 = 3 \cdot \underline{{}^2 \text{Log } 2} = 3$$

$$b) {}^2 \text{Log } 64 = {}^2 \text{Log } 2^6 = 6 \cdot {}^2 \text{Log } 2 = 6$$

$$c) {}^3 \text{Log } 81 = {}^3 \text{Log } 3^4 = 4 \cdot {}^3 \text{Log } 3 = 4$$

$$d) {}^5 \text{Log } 125 = {}^5 \text{Log } 5^3 = 3 \cdot {}^5 \text{Log } 5 = 3$$

$$e) {}^7 \text{Log } 49 = {}^7 \text{Log } 7^2 = 2 \cdot {}^7 \text{Log } 7 = 2.$$

$${}^2 \text{Log } 2 = \frac{\text{Log } 2}{\text{Log } 2} = 1$$

$$\boxed{{}^x \text{Log } x = \frac{\text{Log } x}{\text{Log } x} = 1}$$

$$a) {}^2 \text{Log } 8 = \frac{\text{Log } 8}{\text{Log } 2} = \frac{\text{Log } 2^3}{\text{Log } 2} = \frac{3 \text{Log } 2}{\text{Log } 2} = 3$$

$$c) {}^3 \text{Log } 81 = \frac{\text{Log } 81}{\text{Log } 3} = \frac{\text{Log } 3^4}{\text{Log } 3} = \frac{4 \text{Log } 3}{\text{Log } 3} = 4$$

## berbagai Contoh

a)  $x \text{ Log } x^8$

cara 1:  $x \text{ Log } x^8 = 8 \text{ Log } x = 8$

cara 2:  $x \text{ Log } x^8 = \frac{\text{Log } x^8}{\text{Log } x} = \frac{8 \text{ Log } x}{\text{Log } x} = 8$

b)  $\frac{{}^2\text{Log } 64}{{}^3\text{Log } 81} =$

cara 1:  $\frac{{}^2\text{Log } 64}{{}^3\text{Log } 81} = \frac{2 \text{ Log } 2^6}{{}^3\text{Log } 3^4} = \frac{6 \text{ Log } 2}{4 \text{ Log } 3} = \frac{6}{4} = \frac{3}{2}$

cara 2:  $\frac{{}^2\text{Log } 64}{{}^3\text{Log } 81} = \frac{\text{Log } 64}{\text{Log } 2} = \frac{\text{Log } 2^6}{\text{Log } 2} = \frac{6 \text{ Log } 2}{\text{Log } 2} = 6$   
 $\frac{{}^3\text{Log } 81}{{}^3\text{Log } 81} = \frac{\text{Log } 81}{\text{Log } 3} = \frac{\text{Log } 3^4}{\text{Log } 3} = \frac{4 \text{ Log } 3}{\text{Log } 3} = 4$

$$\frac{{}^2\text{Log } 64}{{}^3\text{Log } 81} = \frac{6}{4} = \frac{3}{2}$$

c) nyatakan hasilnya dalam  $\text{Log } 2$ ,  $\text{Log } 3$ ,  
 $\text{Log } 5$  atau  $\text{Log } 7$

$$\frac{{}^2\text{Log } 24}{{}^4\text{Log } 48}$$

Cara 1 :

$$\begin{aligned}\frac{{}^2\text{Log } 24}{{}^4\text{Log } 48} &= \frac{{}^2\text{Log } (2^3 \cdot 3)}{{}^4\text{Log } (4^2 \cdot 3)} = \frac{{}^2\text{Log } 2^3 + {}^2\text{Log } 3}{{}^4\text{Log } 4^2 + {}^4\text{Log } 3} \\ &= \frac{3 \cdot \text{Log } 2 + {}^2\text{Log } 3}{2 \cdot \text{Log } 4 + {}^4\text{Log } 3} = \frac{3 + {}^2\text{Log } 3}{2 + {}^4\text{Log } 3} \\ &= \frac{3 + \text{Log } 3 / \text{Log } 2}{2 + \text{Log } 3 / \text{Log } 4} \\ &= \frac{3 + \frac{\text{Log } 3}{\text{Log } 2}}{2 + \frac{\text{Log } 3}{2 \text{Log } 2}} // =\end{aligned}$$

Cara 2 :

$$\begin{aligned}\frac{{}^2\text{Log } 24}{{}^4\text{Log } 48} &= \frac{\text{Log } 24}{\text{Log } 2} \cdot \frac{\text{Log } 48}{\text{Log } 4} \\ &= \frac{\text{Log } (2^3 \cdot 3)}{\text{Log } 2} \times \frac{\text{Log } 2^2}{\text{Log } (2^2 \cdot 3)} \\ &= \frac{\text{Log } 2^3 + \text{Log } 3}{\text{Log } 2} \times \frac{2 \text{Log } 2}{\text{Log } 2^2 + \text{Log } 3} \\ &= \frac{3 \text{Log } 2 + \text{Log } 3}{4 \text{Log } 2 + \text{Log } 3} //\end{aligned}$$

d) nyatakan hasilnya dalam  $\log 2$ ,  $\log 3$ ,  $\log 5$  atau  $\log 7$

$$\textcircled{a} \log 8 = \log 2^3 = \underline{\underline{3 \log 2}}$$

$$\textcircled{b} \log 20 = \log (2^2 \cdot 5) = \log 2^2 + \log 5 = \underline{2 \log 2} + \log 5$$

$$\textcircled{c} \log 400 = \log (5^2 \cdot 2^4) = \log 5^2 + \log 2^4 \\ = \underline{2 \log 5} + \underline{4 \log 2}$$

$$\textcircled{d} 16 \log \frac{1}{9} = \frac{\log 3^{-2}}{\log 16} = \frac{\log 3^{-2}}{\log 2^4} = \frac{-2 \log 3}{4 \log 2}$$

$$\textcircled{e} \frac{3 \log 32}{2 \log 9} \times \frac{3 \log 15}{2 \log 75} = \frac{\log 32}{\log 3} \cdot \frac{\log 9}{\log 2} \times \frac{\log 15}{\log 3} \cdot \frac{\log 75}{\log 2} \\ = \frac{\log 2^5}{\log 3} \times \frac{\log 2}{\log 3^2} \times \frac{\log (5 \cdot 3)}{\log 3} \times \frac{\log 2}{\log (5^2 \cdot 3)} \\ = \frac{5 \log 2}{\log 3} \cdot \frac{\log 2}{2 \log 3} \cdot \frac{(\log 5 + \log 3)}{\log 3} \times \frac{\log 2}{2 \log 5 + \log 3} \\ = \frac{5 (\log 2)^3 (\log 5 + \log 3)}{2 (\log 3)^3 (2 \log 5 + \log 3)}$$

12

e)  $\text{Log } 2 = a$ ,  $\text{Log } 3 = b$ ,  $\text{Log } 4 = c$ ,  $\text{Log } 7 = d$ ,  $\text{Log } 6 = e$

$$\begin{aligned} \textcircled{1} \quad \frac{{}^2\text{Log } 9}{{}^4\text{Log } 36} &= \frac{\text{Log } 9}{\text{Log } 2} \cdot \frac{\text{Log } 36}{\text{Log } 4} \\ &= \frac{\text{Log } 3^2}{\text{Log } 2} \times \frac{\text{Log } 2^2}{\text{Log } 6^2} \\ &= \frac{2 \text{Log } 3}{\text{Log } 2} \times \frac{2 \text{Log } 2}{2 \text{Log } 6} \\ &= \frac{2b}{a} \cdot \frac{a}{e} = \frac{2b}{e} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad \frac{{}^{32}\text{Log } \frac{1}{81}}{{}^3\text{Log } \frac{1}{49}} &= \frac{\frac{\text{Log } 3^{-4}}{\text{Log } 2^5}}{\frac{\text{Log } 7^{-2}}{\text{Log } 3}} = \frac{-4 \text{Log } 3}{5 \text{Log } 2} \cdot \frac{-2 \text{Log } 7}{\text{Log } 3} \\ &= \frac{-4}{5} \frac{\text{Log } 3}{\text{Log } 2} \times \frac{\text{Log } 3}{2 \text{Log } 7} \\ &= \frac{2}{5} \frac{b^2}{ad} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad {}^{1/32}\text{Log } \frac{1}{49} &= \frac{\text{Log } 7^{-2}}{\text{Log } 2^{-5}} = \frac{-2 \text{Log } 7}{-5 \text{Log } 2} = \frac{-2d}{-5a} \\ &= \frac{2d}{5a} \end{aligned}$$

$$f) \text{Log } 2 = a, \text{Log } 3 = b, \text{Log } 5 = c, \text{Log } 7 = d$$

$$\begin{aligned} \textcircled{a} \text{Log } \sqrt[3]{\frac{1}{49}} &= \text{Log} \left( \frac{1}{49} \right)^{1/3} = \text{Log} (7^{-2})^{1/3} \\ &= \text{Log } 7^{-2/3} = -\frac{2}{3} \text{Log } 7 \\ &= -\frac{2}{3} d \end{aligned}$$

$$\begin{aligned} \textcircled{b} \text{Log } \sqrt[3]{\frac{25}{81}} &= \text{Log} \left( \frac{25}{81} \right)^{1/3} = \frac{1}{3} \text{Log} \frac{25}{81} \\ &= \frac{1}{3} \text{Log} \frac{5^2}{3^4} = \frac{1}{3} (\text{Log } 5^2 - \text{Log } 3^4) \\ &= \frac{1}{3} (2 \text{Log } 5 - 4 \text{Log } 3) \\ &= \frac{1}{3} (2c - 4b) \end{aligned}$$

$$\begin{aligned} \textcircled{c} \text{Log} \frac{\sqrt{35}}{\sqrt[3]{14}} &= \text{Log} \sqrt{35} - \text{Log} (14)^{1/3} \\ &= \text{Log} (7 \cdot 5)^{1/2} - \text{Log} (7 \cdot 2)^{1/3} \\ &= \frac{1}{2} [\text{Log } 7 + \text{Log } 5] - \frac{1}{3} [\text{Log } 7 + \text{Log } 2] \\ &= \underline{\underline{\frac{1}{2} [d + c] - \frac{1}{3} [d + a]}} \end{aligned}$$

$$g) \text{Log } 2 = a, \text{Log } 3 = b, \text{Log } 5 = c, \text{Log } 7 = d$$

$$\begin{aligned} \textcircled{a} \text{Log } \frac{\sqrt[5]{2}}{\sqrt[3]{3}} &= \text{Log } \frac{2^{1/5}}{3^{1/3}} = \text{Log } 2^{1/5} - \text{Log } 3^{1/3} \\ &= \frac{1}{5} \text{Log } 2 - \frac{1}{3} \text{Log } 3 \\ &= \underline{\underline{\frac{1}{5} a - \frac{1}{3} b}} \end{aligned}$$

$$\begin{aligned} \textcircled{a} 2 \cdot {}^2\text{Log } \frac{2}{3} + {}^2\text{Log } \frac{81}{8} - 2 {}^2\text{Log } \frac{3}{4} &= \\ = 2 \cdot \frac{\text{Log } \frac{2}{3}}{\text{Log } 2} + \frac{\text{Log } \frac{81}{8}}{\text{Log } 2} - 2 \frac{\text{Log } \frac{3}{4}}{\text{Log } 2} &= \\ = \frac{2(\text{Log } 2 - \text{Log } 3) + (\text{Log } 81 - \text{Log } 8) - 2(\text{Log } 3 - \text{Log } 4)}{\text{Log } 2} &= \\ = \frac{2(\text{Log } 2 - \text{Log } 3) + (4\text{Log } 3 - 3\text{Log } 2) - 2(\text{Log } 3 - 2\text{Log } 2)}{\text{Log } 2} &= \\ = \frac{3\text{Log } 2}{\text{Log } 2} = \underline{\underline{3}} \end{aligned}$$

h) Jika  ${}^3\text{Log} 5 = a$  hitung  ${}^{25}\text{Log} 27$

$${}^{25}\text{Log} 27 = \frac{\text{Log} 27}{\text{Log} 25} = \frac{\text{Log} 3^3}{\text{Log} 5^2} = \frac{3 \text{Log} 3}{2 \text{Log} 5} = \frac{3}{2} \frac{1}{a}$$

$${}^3\text{Log} 5 = a$$

$$\frac{\text{Log} 5}{\text{Log} 3} = a$$

i) Jika  ${}^2\text{Log} 3 = \frac{2}{p}$  hitung  $\frac{1}{4} \text{Log} \frac{16}{\sqrt{27}}$

$$\frac{\text{Log} 3}{\text{Log} 2} = \frac{2}{p} \Rightarrow \text{Log} 3 = \frac{2}{p} \text{Log} 2$$

$$\begin{aligned} \frac{1}{4} \text{Log} \frac{16}{\sqrt{27}} &= \frac{\text{Log} 16 - \text{Log} \sqrt{27}}{\text{Log} \frac{1}{4}} \\ &= \frac{\text{Log} 2^4 - \frac{1}{2} \text{Log} 3^3}{\text{Log} 2^{-2}} = \frac{4 \text{Log} 2 - \frac{3}{2} \text{Log} 3}{-2 \text{Log} 2} \\ &= \frac{4 \text{Log} 2 - \frac{3}{2} \cdot \frac{2}{p} \text{Log} 2}{-2 \text{Log} 2} = \frac{4 - \frac{3}{p}}{-2} \\ &= -2 + \frac{3}{2p} // \end{aligned}$$

j) Hitung  $10^{\text{Log } x^2}$

$$f = 10^{\text{Log } x^2}$$

$$\text{Log } f = \text{Log } 10^{\text{Log } x^2}$$

$$\text{Log } f = \text{Log } x^2 \underline{\underline{\text{Log } 10}}$$

$$\text{Log } f = \text{Log } x^2$$

$$f = x^2$$

k) Hitung  $g^{3 \text{Log } a}$

$$f = g^{3 \text{Log } a}$$

$$\text{log } f = 3 \text{Log } a \text{Log } g$$

$$= \frac{\text{Log } a}{\text{Log } 3} 2 \text{Log } 3$$

$$= 2 \text{Log } a$$

$$= \text{Log } a^2$$

$$\underline{\underline{f = a^2}}$$

l) Hitung  $10^{\text{log } \frac{1}{\sqrt{x}}}$

$$f = 10^{\text{log } \frac{1}{\sqrt{x}}}$$

$$\text{Log } f = \text{Log } 10^{\text{Log } \frac{1}{\sqrt{x}}}$$

$$= \text{Log } \frac{1}{\sqrt{x}} \text{Log } 10$$

$$= \text{Log } \frac{1}{\sqrt{x}}$$

$$\underline{\underline{f = \frac{1}{\sqrt{x}}}}$$

$$m) \quad {}^2 \text{Log}(3x+2) = 3$$

$$\frac{\text{Log}(3x+2)}{\text{Log} 2} = 3$$

$$\text{Log}(3x+2) = 3 \text{Log} 2 = \text{Log} 2^3$$

$$3x+2 = 8$$

$$3x = 6 \rightarrow \underline{\underline{x=2}}$$

$$n) \quad {}^3 \text{Log}(x-2) + {}^3 \text{Log}(x+6) = 2$$

$${}^3 \text{Log}(x-2)(x+6) = 2$$

$$\frac{\text{Log}(x-2)(x+6)}{\text{Log} 3} = 2$$

$$\text{Log}(x-2)(x+6) = 2 \text{Log} 3 = \text{Log} 3^2 = \text{Log} \underline{\underline{9}}$$

$$(x-2)(x+6) = 9$$

$$x^2 + 4x - 12 = 9$$

$$x^2 + 4x - 21 = 0 \rightarrow (x+7)(x-3) = 0$$

$$x = -7 \text{ atau } x = 3$$

$$\underline{\underline{x=-7}} \rightarrow {}^3 \text{Log}(\underline{\underline{-7-2}}) + {}^3 \text{Log}(\underline{\underline{-7+6}}) =$$

bukan

$$x = 3 \rightarrow {}^3 \text{Log}(3-2) + {}^3 \text{Log}(3+6) = 2$$

$$\text{Solusi } \underline{\underline{x=3}}$$

$$o) \quad \text{Log } \underbrace{(x^2 + 5x - 10)} = \text{Log } \underbrace{(3x + 5)}$$

$$x^2 + 5x - 10 = 3x + 5$$

$$x^2 + 2x - 15 = 0$$

$$(x + 5)(x - 3) = 0$$

$$x = -5 \quad \text{atau} \quad x = 3$$

$$\underline{x = -5} \Rightarrow \text{Log } \underbrace{(-5^2 + 5 \cdot 5 - 10)} = \text{Log } \underbrace{(-5 \cdot 3 + 5)}$$

bukan solusi

$$x = 3 \Rightarrow \text{Log } \underbrace{(3^2 + 5 \cdot 3 - 10)} = \text{Log } \underbrace{(3 \cdot 3 + 5)}$$

Solusi x = 3

$$p) \quad x^{-2} \text{Log } \underbrace{(x^2 - 10x + 25)} = x^{-2} \text{Log } \underbrace{(7 - x)}$$

$$x^2 - 10x + 25 = 7 - x$$

$$x^2 - 10x + 18 + x = 0$$

$$x^2 - 9x + 18 = 0$$

$$(x - 3)(x - 6) = 0 \Rightarrow \underline{\underline{x = 3}} \quad \text{atau} \quad \underline{\underline{x = 6}}$$

x = 3 bukan solusi

$$\textcircled{3-2} \text{Log } \underbrace{(3^2 - 10 \cdot 3 + 25)}$$

$$x = 6$$

$$\textcircled{6-2} \text{Log } \underbrace{(6^2 - 10 \cdot 6 + 25)} \quad \text{Solusi } \underline{\underline{x = 6}}$$

Ⓟ

2) populasi suatu hewan langka berkurang 20%  
setiap tahun. Banyaknya hewan ini setelah  
 $t$  tahun memenuhi  $y = y_0 e^{kt}$ .  
Saat ini jumlah hewan 10.000 ekor.  
Kapan jumlah hewan menjadi 1000 ekor  
 $e =$  bilangan natural = 2,71828

1 tahun  $\rightarrow$  8000

$$y = y_0 e^{kt}$$

$$8000 = 10.000 e^{kt}$$

$$\frac{8}{10} = e^{kt}$$

$$\log \frac{8}{10} = \log e^{kt} = kt \log e$$

$$\log 0,8 = k \log e$$

$$1000 = 10000 e^{k \cdot t}$$

$$0,1 = e^{kt}$$

$$\log 0,1 = kt \log e = t \log e$$

$$\log 0,1 = t \cdot \log 0,8$$

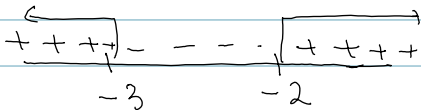
$$t = \frac{\log 0,1}{\log 0,8} = \underline{\underline{10,3 \text{ tahun}}}$$

## Pertidaksamaan Log

$$1) \quad 2 \log(x^2 + 5x + 6) > 1$$

$$(x^2 + 5x + 6) > 0$$

$$(x + 2)(x + 3) > 0$$



$$x > -2 \cup x < -3$$

$$2 \log(x^2 + 5x + 6) > 2 \log 2$$

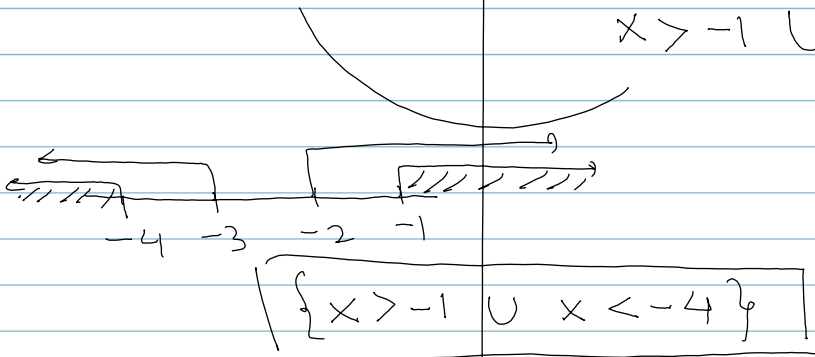
$$x^2 + 5x + 6 > 2$$

$$x^2 + 5x + 4 > 0$$

$$(x + 1)(x + 4) > 0$$



$$x > -1 \cup x < -4$$



$$2) \frac{1}{2} \text{Log}(x^2 - 5x + 4) < -2$$

$$\frac{\text{Log}(x^2 - 5x + 4)}{\text{Log} \frac{1}{2}} < -2$$

$$\text{Log}(x^2 - 5x + 4) < -2 \text{Log} \frac{1}{2}$$

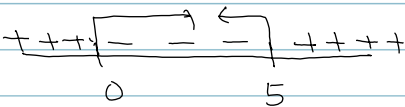
$$\text{Log}(x^2 - 5x + 4) < \text{Log} \frac{1}{2}^{-2}$$

$$\text{Log}(x^2 - 5x + 4) < \text{Log} 4$$

$$x^2 - 5x + 4 < 4$$

$$x^2 - 5x < 0$$

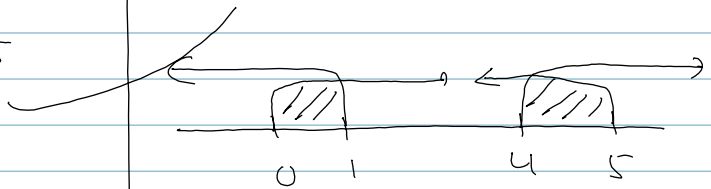
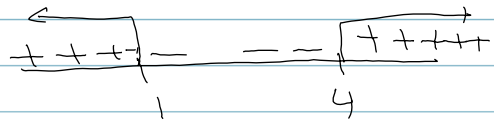
$$x(x - 5) < 0$$



$$0 < x < 5$$

$$x^2 - 5x + 4 > 0$$

$$(x - 1)(x - 4) > 0$$



$$0 < x < 1 \text{ atau } 4 < x < 5$$

22

## Latihan

1)

$$a) \sqrt[8]{\log y^5} =$$

$$\underline{\underline{b) \sqrt[6]{\log \sqrt{e}} =}}$$

$$\underline{\underline{c) 3^x \cdot \log x^2 =}}$$

$$\underline{\underline{d) \frac{-2 \log 32}{-3 \log 9} =}}$$

$$\underline{\underline{e) \frac{5 \log 125}{8 \log 32} =}}$$

=

$$\underline{\underline{g) \frac{9 \log 27}{8 \log 32} =}}$$

2) anggap  $\text{Log } 2 = a$        $\text{Log } 3 = b$        $\text{Log } 5 = c$   
 $\text{Log } 7 = \underline{\underline{d}}$

nyatakan hasil berikut dalam a, b, c, d

a)  $\frac{{}^2\text{Log } 36}{{}^3\text{Log } 48} =$

b)  $\text{Log } 12 =$

c)  $\text{Log } 18 =$

d)  $\text{Log } 800 =$

e)  ${}^{25}\text{Log } \frac{1}{49} =$

f)  $\frac{{}^4\text{Log } 48}{{}^7\text{Log } 25} =$

g)  $\frac{{}^2\text{Log } 96}{{}^3\text{Log } 54} \times \frac{{}^3\text{Log } 24}{{}^2\text{Log } 81} =$

h)  $\frac{{}^{48}\text{Log } \frac{1}{9}}{{}^{63}\text{Log } \frac{1}{24}} =$

i)  ${}^{1/48}\text{Log } \frac{1}{125} =$

(24)

$$3) \underline{\underline{\text{Log } 2 = a}}, \text{Log } 3 = b, \text{Log } 5 = c, \text{Log } 7 = d \\ \text{Log } 11 = e$$

Hitung:

$$\underline{\underline{a)}} \text{Log } \sqrt[5]{64} =$$

$$\underline{\underline{b)}} \text{Log } \sqrt[8]{72} =$$

$$\underline{\underline{c)}} \text{Log } \sqrt[4]{\frac{49}{64}} =$$

$$\underline{\underline{d)}} \text{Log } \sqrt[25]{\frac{15}{80}} =$$

$$\underline{\underline{e)}} \text{Log } \frac{\sqrt{45}}{\sqrt[6]{72}} =$$

$$\underline{\underline{f)}} \text{Log } \frac{\sqrt[3]{135}}{\sqrt[6]{49}} =$$

$$\underline{\underline{g)}} \text{Log } \frac{\sqrt[8]{9}}{\sqrt[24]{16}} =$$

$$\underline{\underline{h)}} \text{Log } \frac{\sqrt[12]{144}}{\sqrt[11]{44}} =$$

$$\underline{\underline{i)}} 2 \text{Log } \frac{3}{4} + 2 \text{Log } \frac{5}{3} =$$

$$\underline{\underline{j)}} 5 \text{Log } \sqrt{\frac{4}{5}} + 5 \text{Log } \sqrt[3]{\frac{7}{3}} + 5 \text{Log } \sqrt{\frac{3}{4}} =$$

$$\underline{\underline{k)}} 2 \text{Log } \frac{3}{2} + 3^2 \text{Log } \frac{4}{7} - 5^2 \text{Log } \frac{9}{21} =$$

~~l)  $\sqrt[8]{\frac{1}{16}}$~~

4) Jika  ${}^2\text{Log} 5 = a$  hitung ✕

a)  ${}^5\text{Log} 2 =$

b)  ${}^{25}\text{Log} 64 =$

c)  ${}^{30}\text{Log} 125 =$

d)  ${}^4\text{Log} 25 + {}^{125}\text{Log} 16 =$

e)  ${}^2\text{Log} 5 + {}^5\text{Log} 2 =$

5) Jika  ${}^3\text{Log} 2 = \frac{1}{5}$  hitung

a)  ${}^9\text{Log} 16 + {}^8\text{Log} 81 =$

b)  ${}^3\text{Log} 2 + {}^4\text{Log} 3 =$

c)  ${}^2\text{Log} 3 \neq {}^3\text{Log} 4 =$

d)  $\frac{{}^4\text{Log} 3}{{}^9\text{Log} 64} =$

e)  $\frac{{}^8\text{Log} 9}{{}^9\text{Log} 81} =$

(26)

6) Hitung  $10^{\text{Log} \sqrt[3]{x}}$

7) Hitung  $81^{\text{Log} b}$

8) Hitung  $64^{\text{Log} \frac{1}{\sqrt{x}}}$

9) Hitung  $x$  dari  ${}^2\text{Log} (3x-1) = 4$

10) Hitung  $x$  dari  ${}^3\text{Log} (2x^2+1) = 2$

11) Hitung  $x$  dari  ${}^5\text{Log} (x^2-1) = 2$

12) Hitung  $x$   
 ${}^2\text{Log} (x-3) + {}^2\text{Log} (x+4) = {}^2\text{Log} 18$

13) Hitung  $x$

$${}^3\text{Log} (x-1) + {}^3\text{Log} (x+5) = 3$$

14) Hitung  $x$

$$\text{Log} (x^2 + 7x - 3) = \text{Log} (x + 13)$$

15) populasi suatu hewan di daerah X berkurang 15% setiap tahun. Jika jumlah hewan sekarang adalah  $y_0 = 20.000$ . Hitung jumlah hewan setelah 5 tahun.

Anggap jumlah populasi hewan menurut hukum

$$y = y_0 e^{kt}$$

Kapan populasi hewan menjadi 5000 ?

16)

$${}^2\text{Log}(x^2 + 7x + 12) > 1$$

Tentukan nilai x yang mungkin.

17)

$$\text{Log}(x^2 - 6x + 8) \leq \text{Log} 3$$

Tentukan nilai x yang mungkin