

pag 182 1a - $\log_3 27 = 3$ ($3^3 = 27$)

1b - $\log_5 125 = 5$ ($5^3 = 125$)

1c - $\log_{10} 10000 = 4$ ($10^4 = 10000$)

1d - $\log_{\frac{1}{2}} 32 = x$

$\left(\frac{1}{2}\right)^x = 2^5$

$\left(\frac{1}{2}\right)^x = \left(\frac{1}{2}\right)^{-5} = x = -5$

1e - $\log_{10} 0,01 = x$

$10^x = 0,01$

$10^x = \frac{1}{10^2} \rightarrow x = -2$

1f - $\log_2 0,5 = x$

$2^x = 0,5$

$2^x = \left(\frac{1}{2}\right)^1$

$2^x = 2^{-1} \rightarrow x = -1$

1g - $\log_2 \sqrt{8} = x$

$2^x = \sqrt{8}$

$2^x = \sqrt{2^3}$

$2^x = 2^{\frac{3}{2}}$

$2^x = 2^{\frac{3}{2}} \rightarrow x = \frac{3}{2}$

1h - $\log_4 \sqrt{32} = x$

$4^x = \sqrt{32}$

$(2^2)^x = \sqrt{2^5}$

$2^{2x} = 2^{\frac{5}{2}}$

$2x = \frac{5}{2} \rightarrow x = \frac{5}{4}$

1i - $\log_{\frac{1}{4}} 16 = x$

$\left(\frac{1}{4}\right)^x = 16$

$\left(\frac{1}{4}\right)^x = \left(\frac{1}{4}\right)^{-2}$

$x = -2$

3a - $\log_2 64 = x$

$2^x = 64$

$2^x = 2^6$

$x = 6$

3b - $\log_x 126 = 3$

$x^3 = 126$

$x = \sqrt[3]{126}$

$x = \sqrt[3]{126}$

3c - $\log_x 625 = 2$

$x^2 = 625$

$x = \pm \sqrt{625}$

$x = \pm 25$

3d - $\log_{10} x = 0$

$10^0 = x$

$x = 1$

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9b - $\log_3 (\pi \cdot \pi^3 \cdot k)$

$\log \pi + \log \pi^3 + \log k - \log 3$

$\log \pi + 3 \cdot \log \pi + \log k - \log 3$

$$10b - \log_7 28 - \log_7 4 = -10d - \log_2 3 = \frac{\log_2 3}{\log_2 2}$$

$$\log_7 28 = \log_7 7 + 1 \quad \log_8 7 = \frac{\log_2 7}{\log_2 8}$$

$$10e - \frac{1}{3} \log_3 7 - \log_3 2 \quad \left| \quad \frac{1}{2} \log_2 3 = \frac{1}{\frac{1}{2}} \cdot \log_2 3 \right.$$

$$\log_3 7^{\frac{1}{3}} - \log_3 2 \quad \left| \quad \frac{1 \cdot \log_2 7}{2 \cdot \log_2 2} = \frac{1}{2} \cdot \log_2 7 \right.$$

$$\log_3 \sqrt[3]{7} - \log_3 2 \quad \left| \quad \frac{3 \cdot \log_2 3}{\log_2 2} = 3 \cdot \log_2 3 \right.$$

$$\log_3 \sqrt[3]{7}$$

$$11b - \log_2 2 = a; \log_2 3 = b$$

$$\log_2 24 =$$

$$\log_2 2^3 \cdot 3$$

$$\log_2 2^3 + \log_2 3$$

$$3 \cdot \log_2 2 + \log_2 3 = 3a + b$$

$$\begin{array}{r} 24 \overline{) 2} \\ 12 \overline{) 2} \\ 6 \overline{) 2} \\ 3 \overline{) 2} \\ 1 \overline{) 2} \end{array} \quad \begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \\ 2 \end{array} \quad \begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \\ 2 \end{array}$$

$$11d - \log_2 1.5 =$$

$$\log_2 \frac{1.5}{10^{1.5}}$$

$$\log_2 3 = \log_2 3 - \log_2 2 \quad a - b$$

$$13 - \log(ab^2)$$

$$\log ab^2 - \log c$$

$$\log a + 2\log b - \log c$$

$$5 + 2 \cdot 3 - 2 = 9$$

$$14 - \log_a 100$$

$$\log_a 2^2 \cdot 5^2$$

$$\log_a 2^2 + \log_a 5^2$$

$$2 \cdot \log_a 2 + 2 \log_a 5$$

$$2 \cdot 20 + 2 \cdot 30 = 100$$

$$-14.5$$

$$\begin{array}{r} 100 \overline{) 2} \\ 50 \overline{) 2} \\ 25 \overline{) 2} \\ 5 \overline{) 2} \\ 1 \overline{) 2} \end{array} \quad \begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \\ 2 \end{array} \quad \begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \\ 2 \end{array}$$

$$18 - \log_a x = 4$$

$$a^4 = x$$

$$a = x^{\frac{1}{4}}$$

$$\left(\frac{x^{\frac{1}{4}}}{3}\right)^8 = x$$

$$\left(\frac{x^{\frac{1}{4}}}{3}\right)^8 = x$$

$$\log_a x = 8$$

$$\left(\frac{a}{3}\right)^8 = x$$

$$\frac{x^{\frac{1}{4}} \cdot 8}{3^8} = x$$

$$\frac{x^2}{3^8} = x$$

$$\frac{x^2}{x^1} = 3^8 \Rightarrow x^{2-1} = 3^8 \quad x = 3^8$$

$$19 - \log_3 5 \cdot \log_2 3^3 \cdot \log_5 2^{\frac{1}{2}} =$$

$$\log_3 5 \cdot \frac{3}{2} \cdot \log_2 3 \cdot \frac{1}{2} \cdot \log_5 2$$

$$\log_3 5 \cdot \frac{3}{2} \log_2 3 \cdot \frac{1}{2} \cdot \frac{1}{2} \log_5 2$$

$$\log_3 5 \cdot \frac{3}{2} \log_2 3 \cdot \frac{1}{4} \log_5 2$$

$$\frac{\log_3 5}{\log_2 3} \cdot \frac{3}{2} \cdot \frac{\log_2 3}{1} \cdot \frac{1}{4} \cdot \frac{\log_5 2}{\log_2 5}$$

$$\frac{3 \cdot 1}{2 \cdot 4} = \frac{3}{8}$$

$$24b - \log \frac{2}{10000}$$

$$\log 2 - \log 10000$$

$$0,3 - \log 10^4$$

$$0,3 - 4 \log 10$$

$$0,3 - 4 \cdot 1 = -3,7$$

$$24f - \log 250$$

$$\log 5^2 \cdot 10$$

$$\log 5^2 + \log 10$$

$$2 \log 5 + \log 10$$

$$2 \cdot 0,70 + 1$$

$$1,4 + 1 = 2,4$$

$$33 - m = C \cdot (1+i)^m \rightarrow 1500000 = 800000 \cdot (1,12)^m$$

Dados:

$$C = 800000$$

$$i = 12\% = 0,12$$

$$t = ? = m$$

$$J = 700000$$

$$M = C + J$$

$$M = 800000 + 700000 = 1500000$$

$$\frac{\log 1,875}{\log 1,12} = m$$

$$\log 1,875 \approx 0,27 \quad \frac{0,27}{0,05} = m \quad m = \frac{27}{5} \text{ anos}$$

$$35 - M = C \cdot (1+i)^m$$

$$C = 1000$$

$$i = 1,5\% = 0,015$$

$$M = 1300$$

$$m = ?$$

$$\frac{\log 1,3}{\log 1,015} = m$$

$$1300 = 1000(1+0,015)^m$$

$$\frac{1300}{1000} = 1,015^m$$

$$1,3 = 1,015^m$$

$$\log 1,3 = \log 1,015^m$$

$$\log 1,3 = m \log 1,015$$

$$\frac{0,11}{0,006} \approx m \quad m \approx 18,3 = 19 \text{ meses}$$

$$37 -$$

$$T_a = 30^\circ\text{C}$$

$$T_f = 100^\circ\text{C} \rightarrow T = 0 \rightarrow \Delta T_0 = 100 - 30 = 70$$

$$T_R = 65^\circ\text{C} \rightarrow T = 5 \text{ min} \rightarrow \Delta T(5) = 65 - 30 = 35 \quad i)$$

$$T_{Fi} = 37^\circ\text{C} \rightarrow t = ? \rightarrow \Delta T(t) = 37 - 30 = 7 \quad ii)$$

$$\Delta T(t) = \Delta T_0 \cdot e^{-\alpha \cdot t} = 70 \cdot e^{-\alpha \cdot t}$$

$$i) \Delta T(5) = 35$$

$$70 \cdot e^{-\alpha \cdot 5} = 35$$

$$e^{-\alpha \cdot 5} = \frac{35}{70} = \frac{1}{2}$$

$$(e^{-\alpha})^5 = \frac{1}{2}$$

$$e^{-\alpha} = \sqrt[5]{\frac{1}{2}}$$

$$ii) \Delta T(t) = 7$$

$$70 \cdot e^{-\alpha \cdot t} = 7$$

$$e^{-\alpha \cdot t} = \frac{7}{70} = \frac{1}{10}$$

$$(e^{-\alpha})^t = \frac{1}{10}$$

$$\left(\sqrt[5]{\frac{1}{2}}\right)^t = \frac{1}{10}$$

$$\log \left(\sqrt[5]{\frac{1}{2}}\right)^t = \log \frac{1}{10}$$

$$t \log \sqrt[5]{\frac{1}{2}} = \log 10^{-1}$$

$$t \log 2^{\frac{1}{5}} = \log 10^{-1}$$

$$t \left(\frac{1}{5}\right) \log 2 = -1 \log 10$$

$$t \cdot \frac{0,3}{5} = -1 \rightarrow t = \frac{-5}{-0,3}$$

$$t = \frac{5}{0,3} = 16,67$$

$$t \approx 17 \text{ min}$$

39- $\gamma = 8\% (0,08)$

$Q(t) = 5$

$Q_0 = 50g$

$Q_0 \cdot e^{-\gamma \cdot t} = 5$

$\ln 0,1 \approx -2,3$

$50 \cdot e^{-0,08 \cdot t} = 5$

$e^{-0,08 \cdot t} = \frac{5}{50} \rightarrow 0,1$

$\log_e e^{-0,08 \cdot t} = \log_e 0,1$

$-0,08 \cdot t \cdot \log_e e = \log_e 0,1$

$0,08 \cdot t \cdot 1 = \ln 0,1$

$-0,08 \cdot t = -2,3$

$t = \frac{-2,3}{-0,08} \rightarrow t = 28,75 \text{ anos}$

41- $\gamma = 4\% \rightarrow 0,04$

$Q(t) = Q_0 \cdot e^{-\gamma \cdot t}$

$Q(t) = \frac{Q_0}{2}$

$\frac{Q_0}{2} = Q_0 \cdot e^{-0,04 \cdot t}$

$\ln 0,5 \approx -0,7$

$\frac{Q_0}{2 Q_0} = e^{-0,04 \cdot t}$

$\frac{1}{2} = e^{-0,04 \cdot t}$

$\ln 0,5 = \ln e^{-0,04 \cdot t}$

$-0,7 = -0,04 \cdot t \cdot \ln e$

$\frac{-0,7}{-0,04} = t \cdot 1$

$t = 17,5 \text{ anos}$