

② Sistemas de equações do 1º Grau 27 PÁGINA 55

DO LIVRO MATEMÁTICA 1 PARA OS CURSOS DE ECONOMIA, ADMI-
NISTRAÇÃO E CIÊNCIAS CONTÁBIS (MEDEIROS, 5ª EDIÇÃO, EDITORA
FORONI ATLAS)

Forma geral $\begin{cases} Ax + By = C \\ A'x + B'y = C' \end{cases}$

① $\begin{cases} 10x + y = 11 \\ 5x - 3y = 2 \quad (-2) \end{cases}$

Método da adição

$$\begin{array}{rcl} \begin{cases} 10x + y = 11 \\ -10x + 6y = -4 \end{cases} & \begin{cases} 5x - 3y = 2 \\ 5x - 3 \cdot 1 = 2 \end{cases} & \begin{cases} 5x = 5 \\ x = 1 \end{cases} \\ 7y = 7 & 5x - 3 = 2 & \\ y = \frac{7}{7} \Rightarrow y = 1 & 5x = 2 + 3 & x = 1 \end{array} \quad x = 1 \text{ e } y = 1$$

② $\begin{cases} -x + 6y = 14 \quad (5) \\ 5x + 3y = 29 \end{cases}$

Método da adição

$$\begin{array}{rcl} \begin{cases} -5x + 30y = 70 \\ 5x + 3y = 29 \end{cases} & \begin{cases} -x + 6y = 14 \\ -x + 6 \cdot 3 = 14 \end{cases} & \\ 33y = 99 & -x + 18 = 14 & \\ y = \frac{99}{33} & -x = 14 - 18 & \\ y = 3 & -x = -4 & \\ & x = 4 & \end{array} \quad x = 4 \text{ e } y = 3$$

③ $\begin{cases} 2x - 9y = -47 \\ -x + 20y = 101 \quad (2) \end{cases}$

Método da adição

$$\begin{array}{rcl} \begin{cases} 2x - 9y = -47 \\ -2x + 40y = 202 \end{cases} & \begin{cases} -x + 20y = 101 \\ -x + 20 \cdot 5 = 101 \end{cases} & \\ 31y = 155 & -x + 100 = 101 & \\ y = \frac{155}{31} & -x = 101 - 100 & \\ y = 5 & -x = 1 & \\ & x = -1 & \end{array} \quad x = -1 \text{ e } y = 5$$

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$$\textcircled{1} \begin{cases} 10x + 3y = \frac{13}{2} & (2) \\ x + 5y = 3 & (-20) \end{cases}$$

Método da adição

$$\begin{array}{rcl} \begin{cases} 20x + 6y = 13 \\ -20x - 100y = -60 \end{cases} & \begin{cases} x + 5y = 3 \\ x + 5 \cdot 1 = 3 \end{cases} & \begin{aligned} x &= \frac{6-5}{2} \\ x &= \frac{1}{2} \end{aligned} \\ -94y &= -47 & \\ y &= -\frac{47}{94} & \\ y &= -\frac{1}{2} & \end{array}$$

$$\textcircled{2} \begin{cases} x - 12y = -36 \\ 4x + 7y = 21 \end{cases}$$

Método da comparação

$$\begin{array}{rcl} x - 12y = -36 & 4x + 7y = 21 & -36 + 12y = \frac{21-7y}{4} \\ x = -36 + 12y & 4x = 21 - 7y & \\ x = \frac{21-7y}{4} & & 4(-36 + 12y) = 21 - 7y \\ -144 + 48y = 21 - 7y & & 48y + 7y = 21 + 144 \\ 55y = 165 & & y = \frac{165}{55} \\ y = 3 & & \end{array}$$

$$x = 0 \text{ e } y = 3$$

$$\textcircled{6} \begin{cases} \frac{1}{4}x + y = 6 \\ x + \frac{2}{3}y = 6 \end{cases}$$

Método da comparação

$$\frac{1}{4}x + y = 6$$

$$y = 6 - \frac{1}{4}x$$

$$y = \frac{24 - 1x}{4}$$

$$x + \frac{2}{5}y = 6$$

$$\frac{2}{5}y = 6 - x$$

$$y = \frac{6 - x}{\frac{5}{2}}$$

$$y = 6 - x \cdot \frac{5}{2}$$

$$y = \frac{30 - 5x}{2}$$

$$\frac{24 - 1x}{4} = \frac{30 - 5x}{2}$$

$$2(24 - 1x) = 4(30 - 5x)$$

$$48 - 2x = 120 - 20x$$

$$20x - 2x = 120 - 48$$

$$18x = 72$$

$$x = \frac{72}{18}$$

$$x = 4$$

$$\frac{1}{4}x + y = 6$$

$$\frac{1}{4} \cdot 4 + y = 6$$

$$1 + y = 6$$

$$y = 6 - 1$$

$$y = 5$$

$$x = 4 \text{ e } y = 5$$

$$\begin{cases} -0,1x - y = 5,8 \\ x + 0,3y = -3,5 \end{cases}$$

Método da comparação

$$\frac{1}{10}x - y = \frac{58}{10}$$

$$-y = \frac{58}{10} - \frac{1}{10}x$$

$$y = -\frac{58 - 1x}{10}$$

$$x + \frac{3}{10}y = -\frac{35}{10}$$

$$\frac{3}{10}y = -\frac{35}{10} - x$$

$$\frac{3}{10}y = -\frac{35 - 10x}{10}$$

$$y = -\frac{35 - 10x}{3}$$

$$y = -\frac{35 - 10x}{3} \cdot \frac{10}{10}$$

$$y = -\frac{35 - 10x}{3}$$

$$\frac{-38-4x}{10} = \frac{-35-10x}{3}$$

$$3(-38-4x) = 10(-35-10x)$$

$$-114-12x = -350-100x$$

$$-12x+100x = -350+114$$

$$88x = -176$$

$$x = -2$$

$$-0,4x - y = 3,8$$

$$-\frac{4}{10}x - y = \frac{38}{10}$$

$$-\frac{4}{10}(-2) - y = \frac{38}{10}$$

$$\frac{8}{10} - y = \frac{38}{10}$$

$$-y = \frac{38}{10} - \frac{8}{10}$$

$$-y = \frac{30}{10}$$

$$-y = 3$$

$$y = -3$$

$$x = -2 \text{ e } y = -3$$

$$\begin{cases} \frac{4x+3y}{6} = \frac{13}{60} \\ -10x+y = -0,7 \end{cases}$$

Método da comparação

$$\frac{4x+3y}{6} = \frac{13}{60}$$

$$\frac{40x+30y}{60} = \frac{13}{60}$$

$$40x+30y = 13$$

$$30y = 13-40x$$

$$y = \frac{13-40x}{30}$$

$$-10x+y = -0,7$$

$$-10x+y = -\frac{7}{10}$$

$$y = -\frac{7}{10} + 10x$$

$$y = \frac{-7+100x}{10}$$

$$\frac{13-40x}{30} = \frac{-7+100x}{10}$$

$$\frac{13-40x}{30} = \frac{-21+300x}{30}$$

$$13-40x = -21+300x$$

$$-40x-300x = -21-13$$

$$-340x = -34$$

$$x = \frac{-34}{-340}$$

$$x = \frac{1}{10}$$

$$x = 0,1$$

$$-10x+y = -0,7$$

$$-10 \cdot 0,1 + y = -0,7$$

$$-1 + y = -0,7$$

$$y = -0,7 + 1$$

$$y = 0,3$$

$$x = 0,1 \text{ e } y = 0,3$$

$$\begin{cases} \frac{4}{3}x - \frac{2}{9}y = 2 \\ \frac{1}{3}x - \frac{3}{2}y = -12,9 \end{cases}$$

Método da substituição

$$\frac{4}{3}x - \frac{2}{9}y = 2$$

$$\frac{1}{3}x - \frac{3}{2}y = -12,9$$

$$\frac{12x - 2y = 18}{9}$$

$$\frac{1}{3}x - \frac{3}{2}y = \frac{-129}{10}$$

$$12x - 2y = 18 \quad (\div 2)$$

$$2x - 15y = -129$$

$$6x - y = 9$$

$$10$$

$$-y = 9 - 6x$$

$$2x - 15y = -129$$

$$y = -(9 - 6x)$$

$$2x - 15[-(9 - 6x)] = -129$$

$$2x + 15(9 - 6x) = -129$$

$$\frac{4}{3}x - \frac{2}{9}y = 2$$

$$2x + 135 - 90x = -129$$

$$-88x = -129 - 135$$

$$\frac{4}{3} \cdot \frac{3}{1} - \frac{2}{9}y = 2$$

$$-88x = -264$$

$$3,$$

$$x = \frac{-264}{-88}$$

$$\frac{4}{3} - \frac{2}{9}y = 2$$

$$-88$$

$$x = 3$$

$$-\frac{2}{9}y = 2 - \frac{4}{3}$$

$$-\frac{2}{9}y = -2$$

$$x = 3 \text{ e } y = 9$$

$$y = \frac{-2}{-\frac{2}{9}}$$

$$y = -2 \left(-\frac{9}{2} \right)$$

$$y = -1(-9)$$

$$y = 9$$

10) $\begin{cases} x = 4y + 1 \\ y = 2x + 1 \end{cases}$ Método da substituição

$$x = 4y + 1$$

$$y = 2x + 1$$

$$x = 4y + 1$$

$$y = 2(4y + 1) + 1$$

$$x = 4\left(-\frac{3}{7}\right) + 1$$

$$x = -\frac{5}{7} \text{ e } y = -\frac{3}{7}$$

$$y = 8y + 2 + 1$$

$$y - 8y = 3$$

$$x = -\frac{12}{7} + 1$$

$$-7y = 3$$

$$7$$

$$y = \frac{3}{-7}$$

$$x = \frac{-12 + 7}{7}$$

$$y = -\frac{3}{7}$$

$$x = -\frac{5}{7}$$

11) $\begin{cases} 4x - \frac{3}{2}y = 0 \\ 5x + y = 0 \end{cases}$

Método da substituição

$$5x + y = 0$$

$$4x - \frac{3}{2}y = 0$$

$$5x + y = 0$$

$$y = -5x$$

$$4x - \frac{3}{2}(-5x) = 0$$

$$5(0) + y = 0$$

$$0 + y = 0$$

$$y = 0$$

$$4x + \frac{15x}{2} = 0$$

$$\frac{8x + 15x}{2} = 0$$

$$x = 0 \text{ e } y = 0$$

$$\frac{23x}{2} = 0$$

$$x = \frac{0}{\frac{23}{2}}$$

$$x = 0$$

12) $\begin{cases} x+y=1 \\ x+y=5 \end{cases}$ O sistema não tem solução.

10) Funções 2, PÁGINA 80 DO LIVRO MATEMÁTICA 1 PARA OS CURSOS DE ECONOMIA, ADMINISTRAÇÃO E CIÊNCIAS CONTÁBEIS (MEDEIROS, 3ª EDIÇÃO, EDITORA ATLAS)

1) $y = 6x + 8$ $D = \mathbb{R}$

2) $y = 3x^2 + 10x + 1$ $D = \mathbb{R}$

3) $y = 9 - x^2$ $D = \mathbb{R}$

4) $y = \frac{2}{1-x}$ $1-x \neq 0$ $D = \{x \in \mathbb{R} / x \neq 1\}$ ou $D = \mathbb{R} - 1$
 $-x \neq -1$
 $x \neq 1$

5) $y = \frac{x+1}{x}$ $x \neq 0$ $D = \{x \in \mathbb{R} / x \neq 0\}$ ou $D = \mathbb{R} - 0$

6) $y = \frac{x^2 - 10}{9}$ $D = \mathbb{R}$

7) $y = \sqrt{2x-10}$ $2x-10 \geq 0$ $2x-10=0$
 $2x=10$
 $x=\frac{10}{2}$
 $x=5 \Rightarrow x \geq 5$
 $D = \{x \in \mathbb{R} / x \geq 5\}$

8) $y = \sqrt[3]{x^2-9}$ $D = \mathbb{R}$

$$9) y = \frac{1}{x^2 - 6x + 8}$$

$$D = \{x \in \mathbb{R} / x \neq 2 \text{ e } x \neq 4\}$$

$$x^2 - 6x + 8 \neq 0$$

$$\Delta = B^2 - 4AC$$

$$x \neq \frac{-B \pm \sqrt{\Delta}}{2A}$$

$$\Delta = (-6)^2 - 4 \cdot 1 \cdot 8$$

$$2A$$

$$\Delta = 36 - 32$$

$$\Delta = 4$$

$$x' \neq \frac{-(-6) \pm \sqrt{4}}{2 \cdot 1}$$

$$x' \neq \frac{6 \pm 2}{2}$$

$$x'' \neq \frac{-(-6) - 2}{2 \cdot 1}$$

$$x' \neq \frac{8}{2}$$

$$x'' \neq \frac{4}{2}$$

$$x' \neq 4$$

$$x'' \neq \frac{2}{2} \Rightarrow x'' \neq 1$$

$$10) y = \sqrt{\frac{x - x^2 + 15}{4}}$$

$$D = \{x \in \mathbb{R} / -\frac{3}{2} \leq x \leq \frac{5}{2}\}$$

$$\frac{x - x^2 + 15}{4} \geq 0$$

$$\frac{x - x^2 + 15}{4} = 0$$

$$\Delta = B^2 - 4AC$$

$$\Delta = 1^2 - 4(-1)15$$

$$\Delta = 16 + 240$$

$$\Delta = 256$$

$$4x - 4x^2 + 15 = 0$$

$$-4x^2 + 4x + 15 = 0$$

$$x = \frac{-B \pm \sqrt{\Delta}}{2A}$$

$$x' = \frac{-1 + \sqrt{256}}{2(-1)}$$

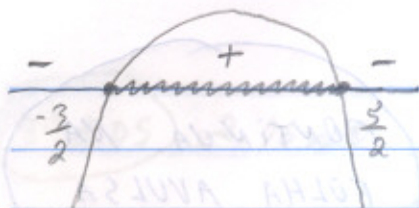
$$x'' = \frac{-1 - \sqrt{256}}{2(-1)}$$

$$x' = \frac{-1 + 16}{-2}$$

$$x'' = \frac{-1 - 16}{-2}$$

$$x' = -\frac{15}{2} \Rightarrow x' = -\frac{3}{2}$$

$$x'' = \frac{15}{2} \Rightarrow x'' = \frac{3}{2}$$



$$11) y = \frac{6}{\sqrt{x^2 - 4x + 3}}$$

$$1^a \text{ OBS } \sqrt{x^2 - 4x + 3} \neq 0$$

$$x^2 - 4x + 3 \neq 0$$

$$x = \frac{-B \pm \sqrt{\Delta}}{2A}$$

$$\Delta = B^2 - 4AC$$

$$\Delta = (-4)^2 - 4 \cdot 1 \cdot 3$$

$$\Delta = 16 - 12$$

$$\Delta = 4$$

$$2^a \text{ OBS } x^2 - 4x + 3 > 0$$

$$x' = \frac{-(-4) + \sqrt{4}}{2 \cdot 1}$$

$$x'' = \frac{-(-4) - \sqrt{4}}{2 \cdot 1}$$

$$D = \{x \in \mathbb{R} / x < 1 \text{ ou } x > 3\}$$

$$x' = \frac{4 + 2}{2}$$

$$x'' = \frac{4 - 2}{2}$$

$$x' = \frac{6}{2}$$

$$x'' = \frac{2}{2}$$

$$x' = 3$$

$$x'' = 1$$

$$1^a \text{ OBS } x' \neq 3$$

$$x'' \neq 1$$

$$2^a \text{ OBS }$$



$$12) y = \sqrt{\frac{2x-3}{1-5x}}$$

$$D = \left\{ x \in \mathbb{R} / \frac{1}{5} < x \leq \frac{3}{2} \right\}$$

$$1^a \text{ OBS } 2x - 3 \geq 0$$

$$2x - 3 = 0$$

$$2x = 3$$

$$x = \frac{3}{2} \Rightarrow x \geq \frac{3}{2}$$

$$2^a \text{ OBS } 1 - 5x \neq 0$$

$$-5x \neq -1$$

$$x \neq -\frac{1}{5} \Rightarrow x \neq \frac{1}{5}$$

$$3^a \text{ OBS }$$

NO VERSO



3ª OBS

$$1-3x \geq 0$$

$$1-3x = 0$$

$$-3x = -1$$

$$x = \frac{1}{3}$$

$$-3$$

$$\rightarrow x = \frac{1}{3} \Rightarrow x \geq \frac{1}{3}$$

CONTINUA NA
FOLHA AVULSA

13) $y = \ln(x-5)$

$$D = \{x \in \mathbb{R} / x > 5\}$$

$$x-5 > 0$$

$$x-5 = 0$$

$$x = 5 \Rightarrow x > 5$$

14) $y = \ln(16-10x+x^2)$

$$16-10x+x^2 > 0$$

$$\Delta = B^2 - 4AC$$

$$D = \{x \in \mathbb{R} / x < 2 \text{ ou } x > 8\}$$

$$x = \frac{-B \pm \sqrt{\Delta}}{2A}$$

$$2A$$

$$\Delta = (-10)^2 - 4 \cdot 1 \cdot 16$$

$$\Delta = 100 - 64$$

$$\Delta = 36$$

$$x' = \frac{-(-10) + \sqrt{36}}{2 \cdot 1}$$

$$x'' = \frac{-(-10) - \sqrt{36}}{2 \cdot 1}$$

$$x' = \frac{10+6}{2}$$

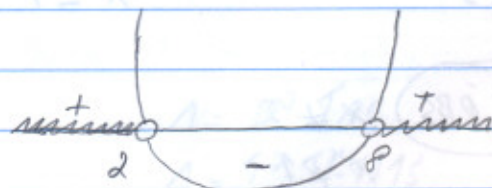
$$x'' = \frac{10-6}{2}$$

$$x' = 16$$

$$x'' = 4$$

$$x' = 8$$

$$x'' = 2$$



15) $y = \ln\left(\frac{x}{x^2-16}\right)$

$$D = \{x \in \mathbb{R} / x > 0 \text{ e } x \neq \pm 4\}$$

1ª OBS $x > 0$

2ª OBS $x^2 - 16 \neq 0 \Rightarrow x \neq \pm \sqrt{16}$
 $x^2 \neq 16 \Rightarrow x \neq \pm 4$

3.ª OBS $x^2 - 16 \geq 0$ $x^2 - 16 = 0 \rightarrow x = \pm 4$

$$x^2 = 16$$

$$x = \pm \sqrt{16}$$



CONTINUA NA
FOLHA AVULSA

16) $D = \{x \in \mathbb{R} / x \geq 0\}$

11) Logaritmos $\rightarrow$ PÁGINA 48 DO LIVRO MATEMÁTICA 1
PARA OS CURSOS DE ECONOMIA, ADMINISTRAÇÃO E CIÊNCIAS CONTÁBEIS (MEDEIROS,
5.ª EDIÇÃO, EDITORA ATLAS)

1) $\log_2 x \cdot \ln 2 = 1$

$$\frac{\ln x}{\ln 2} \cdot \ln 2 = 1$$

$$\ln x = 1$$

$$x = e^1$$

$$x = e \Rightarrow x \approx 2,718281$$

2) $\log_3 x = \log_9 x \rightarrow \log_3 x = 0$ $\frac{\ln x}{\ln 3} = 0$

$$\log_3 x - \log_9 x = 0$$

$$\ln x = 0 \cdot \ln 3$$

$$\ln x = 0$$

$$x = e^0$$

$$x = 1$$

$$\frac{\log_3 x}{\log_9 x} = 0$$

$$\log_3 x = 0 \cdot \log_9 x$$

3.1) $\log_2 x \cdot \ln x + \ln(x-2) = 0 \rightarrow 2x - 4 = 1$

$$2x = 1 + 4$$

$$2x = 5$$

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

$$x = 2,5$$

$$\ln 2 \cdot \ln x + \ln(x-2) = 0$$

$$\ln x$$

$$\ln 2 + \ln(x-2) = 0$$

$$\ln[2(x-2)] = 0$$

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

$$3.2 \quad \ln \sqrt{x} = \frac{1}{2} \ln 15 - \frac{1}{4} \ln(x+2)$$

$$\ln x = \frac{1}{2} \ln 15 - \frac{1}{4} \ln(x+2)$$

$$\frac{1}{4} \ln x = \frac{1}{2} \ln 15 - \frac{1}{4} \ln(x+2)$$

$$\frac{1}{4} \ln x = \frac{1}{4} \ln 15 - \frac{1}{4} \ln(x+2)$$

$$\frac{1}{4} \ln x = \frac{1}{4} [\ln 15 - \ln(x+2)]$$

$$\ln x = \ln 15 - \ln(x+2)$$

$$\ln x = \ln 15$$

$$\ln(x+2)$$

$$x = \frac{-B \pm \sqrt{\Delta}}{2A}$$

$$\Delta = B^2 - 4AC$$

$$x = \frac{15}{x+2}$$

$$2A$$

$$\Delta = 2^2 - 4 \cdot 1 \cdot (-15)$$

$$\Delta = 4 + 60$$

$$\Delta = 64$$

$$x(x+2) = 15$$

$$x^2 + 2x = 15$$

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

$$x = 3$$

$$x' = \frac{-2 \pm \sqrt{64}}{2 \cdot 1}$$

$$x'' = \frac{-2 \pm \sqrt{64}}{2 \cdot 1}$$

$$x' = \frac{-2 + 8}{2}$$

$$x'' = \frac{-2 - 8}{2}$$

$$x' = \frac{6}{2}$$

$$x'' = \frac{-10}{2}$$

$$x' = 3$$

$$x'' = -5$$

$$3.3 \quad \frac{2^{3x+1}}{3^{2x-1}} = 5^x$$

$$\frac{\ln 2^{3x+1}}{\ln 3^{2x-1}} = \ln 5^x$$

$$\ln 2^{3x+1} - \ln 3^{2x-1} = x \ln 5$$

$$(3x+1) \ln 2 - (2x-1) \ln 3 = x \ln 5$$

$$(3x+1) 0,6931 - (2x-1) 1,099 = x (1,6095)$$

$$2,0793x + 0,6931 - (2,198x - 1,099) = 1,6095x$$

$$2,0793x + 0,6931 - 2,198x + 1,099 = 1,6095x$$

$$-0,1187x + 1,7921 = 1,6095x$$

$$-0,1187x - 1,6095x = -1,7921$$

$$-1,7282x = -1,7921$$

$$\rightarrow x = -1,7921$$

$$-1,7281$$

$$x \approx 1,0370348$$

$$3.4 \quad 7 \cdot 3^{2x+1} = 4^{3x-2}$$

$$\ln 7 \cdot 3^{2x+1} = \ln 4^{3x-2}$$

$$\ln 7 + \ln 3^{2x+1} = (3x-2) \ln 4$$

$$1,9459 + (2x+1) \ln 3 = (3x-2) 1,3863$$

$$1,9459 + (2x+1) 1,099 = 4,1589x - 2,7726$$

$$2,198x + 1,099 = 4,1589x - 2,7726 - 1,9459$$

$$2,198x - 4,1589x = -4,7185 - 1,099$$

$$-1,9609x = -5,8175$$

$$\rightarrow x = -5,8175$$

$$-1,9609$$

$$x \approx 2,9667$$

$$3.5 \quad x^{x^2-7x} = 1$$

$$\ln x^{x^2-7x} = \ln 1$$

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

$$1^{\circ} \text{ Case } x^2-7x = 0$$

$$\ln x$$

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

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

$$x' = 0 \quad x'' - 7 = 0$$

$$x'' = 7$$

2^o Case

$$\ln x = \frac{0}{x^2-7x}$$

$$\ln x = 0$$

$$x = e^0$$

$$x = 1$$

$$x = 0 \text{ ou } x = 7 \text{ ou } x = 1$$

$$3.6 \quad 9^x - 2(3^x) - 35 = 0$$

$$\ln 9^x - \ln 2(3^x) - \ln 35 = 0$$

$$x \ln 9 - (\ln 2 + \ln 3^x) - \ln 35 = 0$$

$$x(2,1972) - (0,6937 + x \ln 3) - 3,5553 = 0$$

$$2,1972x - [0,6937 + x(1,099)] - 3,5553 = 0$$

$$2,1972x - (0,6937 + 1,099x) - 3,5553 = 0$$

$$2,1972x - 0,6937 - 1,099x - 3,5553 = 0$$

$$1,0982x - 4,249 = 0$$

$$1,0982x = 4,249$$

$$x = \frac{4,249}{1,0982}$$

$$1,0982$$

$$x \approx 3,8685$$

$$4.1 \quad 10^{5x} = 432$$

$$\ln 10^{5x} = \ln 432$$

$$5x \ln 10 = \ln 432$$

$$5x(2,3026) = 6,0687$$

$$11,513x = 6,0687$$

$$x = \frac{6,0687}{11,513}$$

$$11,513$$

$$x \approx 0,5271$$

$$5.2 \quad (0,5)^{x+1} = \frac{3}{4}$$

$$\left(\frac{5}{10}\right)^{x+1} = \frac{3}{4}$$

$$\ln \left(\frac{5}{10}\right)^{x+1} = \ln \frac{3}{4}$$

$$\ln 5^{x+1} - \ln 10^{x+1} = \ln 3 - \ln 4$$

$$(x+1) \ln 5 - (x+1) \ln 10 = 1,099 - 1,3863$$

$$(x+1)1,6095 - [(x+1)2,3026] = -0,2873$$

$$1,6095x + 1,6095 - (2,3026x + 2,3026) = -0,2873$$

$$1,6095x + 1,6095 - 2,3026x - 2,3026 = -0,2873$$

$$-0,6932x - 0,6932 = -0,2873$$

$$-0,6932x = -0,2873 + 0,6932$$

$$-0,6932x = 0,4059$$

$$x = \frac{0,4059}{-0,6932}$$

$$x \approx -0,5855$$

$$x \approx -0,5855$$

$$\textcircled{4.3} \left(\frac{1}{2} \right)^{2x} = 0,45$$

$$\frac{1^{2x}}{2^{2x}} = \frac{45}{100}$$

$$\frac{1^{2x}}{2^{2x}} = \frac{45}{100}$$

$$\ln \frac{1^{2x}}{2^{2x}} = \ln \frac{45}{100}$$

$$\ln 1^{2x} - \ln 2^{2x} = \ln 45 - \ln 100$$

$$2x(\ln 1) - 2x(\ln 2) =$$

$$2x(0) - 2x(0,6931) = 3,8067 - 5,6052$$

$$0 - 1,3862x = -0,7985$$

$$x = \frac{-0,7985}{-1,3862}$$

$$x \approx 0,5760$$

$$x \approx 0,5760$$

$$\textcircled{4.4} 35 = (1+x)^5$$

$$\ln 35 = \ln (1+x)^5$$

$$3,5553 = 5 \ln (1+x)$$

$$5 \ln (1+x) = 3,5553$$

$$\ln (1+x) = \frac{3,5553}{5}$$

$$\ln (1+x) = 0,7111$$

$$\ln (1+x) = 0,7111$$

$$1+x = e^{0,7111}$$

$$x = e^{0,7111} - 1$$

$$x = 2,0322 - 1$$

$$x \approx 1,0322$$

1681

4.5 $92,74 = (1+x)^{0,23}$

$92,74 = (1+x)^{\frac{23}{100}}$

100

$\ln \frac{92,74}{100} = \ln (1+x)^{\frac{23}{100}}$

$\ln 92,74 - \ln 100 = \frac{23}{100} \ln (1+x)$

$8,3603 - 4,6052 = \frac{23}{100} \ln (1+x)$

$3,7551 = \frac{23}{100} \ln (1+x)$

$3,7551 \cdot 100 = 23 \ln (1+x)$

$375,51 = 23 \ln (1+x)$

$\frac{375,51}{23} = \ln (1+x)$

$16,3265 = \ln (1+x)$

$\ln (1+x) = 16,3265$

$1+x = e^{16,3265}$

$x = e^{16,3265} - 1$

$x = 12.317.049,8125 - 1$

$x = 12.317.048,8125$

4.6 $1,16 = \left(1 - \frac{x}{4}\right)^{0,3}$

$\frac{116}{100} = \left(\frac{4-x}{4}\right)^{\frac{3}{10}}$

$\ln \frac{116}{100} = \ln \left(\frac{4-x}{4}\right)^{\frac{3}{10}}$

$\ln 116 - \ln 100 = \frac{3}{10} \ln \left(\frac{4-x}{4}\right)$

$4,7536 - 4,6052 = \frac{3}{10} \ln \left(\frac{4-x}{4}\right)$

$$0,1989 = \frac{3}{10} \ln\left(\frac{4-x}{4}\right) \rightarrow \ln\left(\frac{4-x}{4}\right) = 0,6997$$

$$10 \cdot 0,1989 = 3 \ln\left(\frac{4-x}{4}\right) \quad e^{0,6997} = \frac{4-x}{4}$$

$$1,989 = 3 \ln\left(\frac{4-x}{4}\right) \quad 1,64 = \frac{4-x}{4}$$

$$\frac{1,989}{3} = \ln\left(\frac{4-x}{4}\right) \quad 6,56 = 4-x$$

$$0,6997 = \ln\left(\frac{4-x}{4}\right) \quad 6,56 - 4 = -x$$

$$2,56 = -x$$

$$x + 2,56 = 0$$

$$x \approx -2,56$$

$$\textcircled{5.1} \begin{cases} 5^{x+y} = 15,625 \\ 2x-y = -3 \end{cases}$$

$$\begin{cases} x+y = 6 \\ 2x-y = -3 \end{cases}$$

$$3x = 3$$

$$x = 1$$

$$5^{x+y} = 15,625$$

$$\ln 5^{x+y} = \ln 15,625$$

$$(x+y) \ln 5 = 9,6366$$

$$(x+y) 1,6094 = 9,6366$$

$$x+y = \frac{9,6366}{1,6094}$$

$$x+y = 6$$

$$x+y = 6$$

$$x+y = 6$$

$$1+y = 6$$

$$y = 6-1$$

$$y = 5$$

$$x = 1 \text{ dan } y = 5$$

$$\textcircled{5.2} \begin{cases} \log y - \log x = 2 \\ x+2y = 102 \end{cases}$$

$$\log y - \log x = 2$$

$$\frac{\ln y}{\ln 10} - \frac{\ln x}{\ln 10} = 2$$

$$\ln y - \ln x = 2 \ln 10$$

$$\ln y - \ln x = 2 \ln 10$$

$$\ln 10$$

1701

$$\ln y - \ln x = 2.2,3026$$

$$\ln y - \ln x = 4,6052$$

$$\ln \frac{y}{x} = 4,6052$$

$$\frac{y}{x} = e^{4,6052}$$

$$x$$

$$y = 100$$

$$x$$

$$y = 100x$$

$$x = 2 \text{ e } y = 200$$

$$x + 2y = 402$$

$$x + 2(100x) = 402$$

$$x + 200x = 402$$

$$201x = 402$$

$$x = \frac{402}{201}$$

$$201$$

$$x = 2$$

$$y = 100x$$

$$y = 100 \cdot 2$$

$$y = 200$$

① Números Reais *

①.1 Transformação de frações em números decimais

$$\textcircled{1} \frac{1}{5} = 0,2$$

$$\begin{array}{r} 50 \overline{) 10} \\ 100 \end{array} 0,2$$

$$\textcircled{2} \frac{1}{20} = 0,05$$

$$\begin{array}{r} 100 \overline{) 200} \\ 1000 \end{array} 0,05$$

$$\textcircled{3} \frac{8}{3} = 2,6667$$

$$\begin{array}{r} 8 \overline{) 20} \\ 20 \overline{) 20} \\ 20 \overline{) 20} \\ 20 \overline{) 20} \end{array} 2,6666$$

$$\textcircled{4} \frac{1}{3} = 0,3333$$

$$\begin{array}{r} 10 \overline{) 10} \\ 10 \overline{) 10} \\ 10 \overline{) 10} \\ 10 \overline{) 10} \end{array} 0,3333$$

$$\textcircled{5} \frac{23}{45} = 0,5222$$

$$\begin{array}{r} 230 \overline{) 115} \\ 115 \overline{) 115} \\ 120 \overline{) 120} \\ 120 \overline{) 120} \\ 120 \overline{) 120} \end{array} 0,5222$$

$$\textcircled{6} \frac{10}{13} = 0,7692$$

$$\begin{array}{r} 100 \overline{) 123} \\ 090 \\ \underline{30} \\ 030 \\ \underline{20} \\ 010 \end{array}$$

$$\textcircled{7} \frac{16}{43} = 0,3721$$

$$\begin{array}{r} 160 \overline{) 193} \\ 310 \\ \underline{090} \\ 090 \\ \underline{13} \end{array}$$

$$\textcircled{8} \frac{15}{35} = 0,4286$$

$$\begin{array}{r} 150 \overline{) 135} \\ 100 \\ \underline{300} \\ 200 \\ \underline{250} \\ 05 \end{array}$$

$$\textcircled{9} \frac{150}{159} = 0,9091$$

$$\begin{array}{r} 1500 \overline{) 1251} \\ 01500 \\ \underline{01500} \\ 015 \end{array}$$

$$\textcircled{10} \frac{29}{145} = 0,2$$

$$\begin{array}{r} 290 \overline{) 1155} \\ 000 \\ \underline{000} \end{array}$$

1.2 Transformação de números decimais em frações *

$$\textcircled{1} 0,75 = \frac{75}{100} = \frac{3}{4}$$

Dividido por 25

$$\textcircled{2} 32,17 = \frac{3217}{100}$$

$$\textcircled{3} 0,0932 = \frac{932}{10000} = \frac{27}{625}$$

Dividido por 16

$$④ 0,017 = \frac{17}{1.000}$$

$$⑤ 3,292 = 3 + 0,292 = 3 + \frac{292}{1.000} = \frac{3.000 + 292}{1.000} = \frac{3.292}{1.000} = \frac{823}{250}$$

Divide por 4

$$⑥ 14,001 = 14 + 0,001 = 14 + \frac{1}{1.000} = \frac{14.000 + 1}{1.000} = \frac{14.001}{1.000}$$

$$⑦ 4,12 = 4 + 0,12 = 4 + \frac{12}{100} = \frac{400 + 12}{100} = \frac{412}{100} = \frac{103}{25}$$

Divide por 4

$$⑧ 110,431 = 110 + 0,431 = 110 + \frac{431}{1.000} = \frac{110.000 + 431}{1.000} = \frac{110.431}{1.000}$$

$$⑨ 213,79 = 213 + 0,79 = 213 + \frac{79}{100} = \frac{21300 + 79}{100} = \frac{21.379}{100}$$

$$⑩ 0,421 = \frac{421}{1.000}$$

$$⑪ 0,555... = \frac{5}{9}$$

$$⑫ 0,666... = \frac{6}{9} = \frac{2}{3}$$

Divide por 3

$$(93) 2,333... = 2 + 0,333... = 2 + \frac{3^1}{9} = 2 + \frac{1}{3} = \frac{6+1}{3} = \frac{7}{3}$$

Divide por 3

$$(94) 12,777... = 12 + 0,777... = 12 + \frac{7}{9} = \frac{108+7}{9} = \frac{115}{9}$$

$$(95) 0,93181818... = 0,93 + 0,00181818... = \frac{93}{100} + \frac{18}{9900} = \frac{9 \cdot 257 + 18}{9900} = \frac{2313}{9900}$$

$$= \frac{575^{19}}{240055^{55}}$$

Divide por 9

Divide por 25

$$(16) 0,5291291291... = 0,5 + 0,0291291291... = \frac{5^1}{10} + \frac{291}{9990} = \frac{1}{2} + \frac{291}{9990}$$

$$\frac{9995 + 291}{9990} = \frac{2698}{9990} = \frac{2 \cdot 698}{9990}$$

Divide por 2

$$(97) 9,59222... = 9 + 0,59222... = 9 + 0,59 + 0,00222... = 9 + \frac{59}{100} + \frac{2}{900} =$$

$$\frac{3.600 + 539 + 2}{900} = \frac{4.133}{900}$$

$$(98) 17,39939939... = 17 + 0,39939939... = 17 + 0,39 + 0,00939939... =$$

$$= 17 + \frac{39}{100} + \frac{93}{9900} = \frac{168300 + 3366 + 93}{9900} = \frac{171.709}{9900}$$

174

1.3 Cálculo do valor de expressões numéricas *

1) $5(3+0,4) - 3,21$ → $4,68 - 3,21$

$$\frac{5}{5} \left(\frac{3 + \frac{4}{10}}{10} \right) - \frac{321}{100}$$

$$\frac{5}{5} \left(\frac{30 + 4}{10} \right) - \frac{321}{100}$$

$$\frac{5}{5} \left(\frac{34}{10} \right) - \frac{321}{100}$$

$$\frac{2 \cdot 34}{5 \cdot 5} - \frac{321}{100}$$

$$\frac{68}{25} - \frac{321}{100}$$

2) $0,22(11-0,3) + \frac{4}{7}$ → $\frac{10,239}{3,500}$

$$\frac{22}{3000} \left(\frac{11 - \frac{3}{10}}{10} \right) + \frac{4}{7}$$

$$\frac{11}{50} \left(\frac{110 - 3}{10} \right) + \frac{4}{7}$$

$$\frac{11}{50} \left(\frac{107}{10} \right) + \frac{4}{7}$$

$$\frac{1177}{500} + \frac{4}{7}$$

$$\frac{7(1.177) + 500 \cdot 4}{3.500}$$

$$\frac{8.239 + 2.000}{3.500}$$

$$\begin{aligned}
 & \textcircled{3} \quad \frac{4}{3} + \frac{7}{5} \left(\frac{1+4}{2 \cdot 9} \right) - \frac{1}{5} \quad \frac{120 + 101}{90} \\
 & \quad \frac{4}{3} + \frac{7}{5} \left(\frac{9+8}{18} \right) - \frac{1}{5} \quad \frac{221}{90} \\
 & \quad \frac{4}{3} + \frac{7}{5} \left(\frac{17}{18} \right) - \frac{1}{5} \quad \frac{2,455}{90} \\
 & \quad \frac{4}{3} + \frac{119}{90} - \frac{1}{5} \quad \frac{2,46}{90} \\
 & \quad \frac{30.4 + 119 - 18}{90} \\
 & \quad \frac{120 + 119 - 18}{90}
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{4} \quad \frac{112}{17} - \frac{9^2}{55} + \frac{3^2}{62} + 27 \\
 & \quad \frac{112}{17} - \frac{1}{5} + \frac{1}{2} + 27 \\
 & \quad \frac{10.112 - 34 + 85 + 21.170}{170} \\
 & \quad \frac{1120 - 34 + 85 + 3.570}{170}
 \end{aligned}$$

$$\begin{aligned}
 & \frac{4.741}{170} \\
 & 27,89
 \end{aligned}$$

$$\begin{aligned}
 & \textcircled{5} \quad \left(\frac{93}{11} + \frac{1}{10} \right) \left(\frac{17}{8} - \frac{2}{5} \right) \quad \frac{441}{110} \cdot \frac{69}{50} \\
 & \quad \left(\frac{10.93 + 11.1}{110} \right) \left(\frac{5.17 - 82}{40} \right) \quad \frac{30.429}{4.400} \\
 & \quad \left(\frac{430 + 11}{110} \right) \left(\frac{85 - 16}{40} \right) \quad 6,92
 \end{aligned}$$

⑥

$$\begin{array}{r} 1 \\ 5,3 + 0,25 \\ \hline 1 \\ 5,55 \\ \hline 1 \\ 955 \\ 100 \\ \hline 1.100 + 4 \\ 555 \\ \hline 100 + 4 \\ 555 \end{array} \quad \begin{array}{r} 100 + 455.4 \\ 455 \\ \hline 100 + 1.820 \\ 455 \\ \hline 1.920 \\ 455 \\ \hline 4,22 \end{array}$$

⑦

$$\begin{array}{r} 1 + 3 + 9 \\ 2 \quad 5 \\ \hline 1 - 3 + 9 \\ 3 \quad 7 \\ \hline 5 + 6 + 10 \\ 10 \\ \hline 99 - 9 + 9.29 \\ 29 \\ \hline 29 \\ 10 \\ \hline 99 - 9 + 289 \\ 29 \end{array} \quad \begin{array}{r} 29 \\ 10 \\ \hline 289 \\ 29 \\ \hline 29 \cdot 29 \\ 10 \quad 229 \\ \hline 441 \\ 2.290 \\ \hline 0,19 \end{array}$$

⑧

$$\begin{array}{r} \frac{1}{7} \left(\frac{12}{5} - \frac{9}{3} \right) \\ 18 \left(\frac{0,25 - \frac{1}{9}}{9} \right) \\ \frac{1}{7} \left(\frac{36 - 45}{15} \right) \\ 18 \left(\frac{25 - \frac{1}{9}}{100 \cdot 9} \right) \\ \frac{1}{7} \left(-\frac{93}{15} \right) \\ 18 \left(\frac{225 - 900}{900} \right) \end{array} \quad \begin{array}{r} \frac{1}{7} \left(-\frac{3}{5} \right) \\ 18 \left(-\frac{275}{900} \right) \\ -\frac{12}{35} \\ 18 \left(-\frac{7}{36} \right) \\ -\frac{12}{35} \\ -\frac{7}{2} \end{array} \quad \begin{array}{r} -\frac{12}{35} \left(-\frac{2}{7} \right) \\ 29 \\ 245 \\ 0,10 \end{array}$$

⑨

$$\begin{array}{r} \frac{1}{7} + \frac{1}{2} \left(\frac{3-2}{5} \right) \\ 25 + 2(1-3) \\ \hline \frac{1}{7} + \frac{1}{2} \left(\frac{15-2}{5} \right) \\ 25 + 2(1-2) \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{8} \left(\frac{9-3}{7} \right) \\ 0,17 + 5 \\ \hline \frac{1}{8} \left(\frac{1-12}{8} \right) \\ 17 + 5 \\ \hline \end{array}$$

$$\frac{5 + \frac{1}{2} \left(\frac{13}{5} \right)}{25 - \frac{1}{2}} \div \frac{\frac{5}{8} \left(\frac{-19}{4} \right)}{\frac{17 + 500}{100}}$$

$$\frac{5 + \frac{13}{10}}{25 - \frac{1}{2}} \div \frac{-\frac{55}{32}}{\frac{517}{100}}$$

$$\frac{50 - 1}{2} \div \frac{517}{100}$$

$$\frac{49 + 99}{2} \div -\frac{55 \cdot 100}{32 \cdot 517}$$

$$\frac{139}{70} \div -\frac{5500}{16.559}$$

$$\frac{49}{2} \div -\frac{5500}{16.559}$$

$$\frac{139 \cdot 2}{70 \cdot 49} \div -\frac{5.500}{16.559}$$

$$\frac{262}{3430} \div -\frac{5.500}{16.559}$$

$$\frac{262}{3430} \cdot \frac{16.559}{5.500}$$

$$- \frac{4.334.528}{11.865.000}$$

Divide por 8

$$- \frac{541.816}{2.358.125}$$

$$- 0,23$$

10

$$\left\{ 4 + 2 \left[\frac{32 - 1 \left(\frac{5 - 1}{4 \cdot 6 \cdot 8} \right) + 2}{4 \cdot 6 \cdot 8} \right] + 16 \right\}$$

$$\left\{ 4 + 2 \left[\frac{32 - 1 \left(\frac{32 - 6}{48} \right) + 2}{48} \right] + 16 \right\}$$

$$\left\{ 4 + 2 \left[\frac{32 - 1 \left(\frac{26}{48} \right) + 2}{2 \cdot 48} \right] + 16 \right\}$$

$$\left\{ 4 + 2 \left[\frac{32 - \frac{13}{96} + 2}{96} \right] + 16 \right\}$$

$$\left\{ 4 + 2 \left[\frac{96 \cdot 32 - 13 + 2 \cdot 96}{96} \right] + 16 \right\}$$

$$\left\{ 4 + 2 \left[\frac{3072 - 13 + 192}{96} \right] + 16 \right\}$$

$$\left\{ 4 + 2 \left[\frac{3.259}{96 \cdot 48} \right] + 16 \right\}$$

$$\left\{ 4 + \frac{3.259}{48} + 16 \right\}$$

$$\frac{4 \cdot 48 + 3.259 + 16 \cdot 48}{48}$$

$$\frac{192 + 3.259 + 768}{48}$$

$$\frac{5.219}{48}$$

$$87,73$$

$$\begin{aligned}
 11) & 3 \left\{ -1 + 12 \left[-13 + 4 \left(1 - \frac{1}{3} \right) - 1 \right] - 1 \right\} \rightarrow 3 \left\{ \frac{-3 - 408 - 3}{3} \right\} \\
 & 3 \left\{ -1 + 12 \left[-13 + 4 \left(\frac{3-1}{3} \right) - 1 \right] - 1 \right\} \rightarrow 3 \left\{ \frac{-414}{3} \right\} \\
 & 3 \left\{ -1 + 12 \left[-13 + 4 \left(\frac{2}{3} \right) - 1 \right] - 1 \right\} \rightarrow -414 \\
 & 3 \left\{ -1 + 12 \left[-13 + \frac{8}{3} - 1 \right] - 1 \right\} \\
 & 3 \left\{ -1 + 12 \left[\frac{-39 + 8 - 3}{3} \right] - 1 \right\} \\
 & 3 \left\{ -1 + 12 \left[-\frac{34}{3} \right] - 1 \right\} \\
 & 3 \left\{ -1 - \frac{408}{3} - 1 \right\}
 \end{aligned}$$

$$\begin{aligned}
 12) & \frac{1}{9} \left\{ \frac{1}{2} - \left[\frac{1}{9} (9-1) + 8 \right] - \frac{3}{2} \right\} \rightarrow \frac{1}{9} \left\{ -\frac{29}{9} \right\} \\
 & -\frac{2}{5} \left\{ \frac{3}{4} - \left[\frac{5}{5} + 1 \right] - \frac{18}{7} \right\} + 1 \rightarrow \frac{857}{350} \\
 & \frac{1}{9} \left\{ \frac{1}{2} - \left[\frac{1}{9} (8) + 8 \right] - \frac{3}{2} \right\} \rightarrow -\frac{356}{81} \\
 & -\frac{2}{5} \left\{ \frac{3}{4} - \left[\frac{5+5}{5} \right] - \frac{18}{7} \right\} + 1 \rightarrow \frac{857}{350} \\
 & \frac{1}{9} \left\{ \frac{1}{2} - \left[\frac{8}{9} + 8 \right] - \frac{3}{2} \right\} \rightarrow -\frac{356}{81} \cdot \frac{350}{857} \\
 & -\frac{2}{5} \left\{ \frac{3}{4} - \frac{9}{5} - \frac{18}{7} \right\} + 1 \rightarrow \frac{81}{857} \\
 & \frac{1}{9} \left\{ \frac{1}{2} - \left[\frac{8+72}{9} \right] - \frac{3}{2} \right\} \rightarrow -\frac{124600}{69417} \\
 & -\frac{2}{5} \left\{ \frac{105-252-360}{110} \right\} + 1 \rightarrow -1,79 \\
 & \frac{1}{9} \left\{ \frac{1}{2} - \frac{80}{9} - \frac{3}{2} \right\} \\
 & -\frac{2}{5} \left\{ -\frac{507}{110} \right\} + 1 \\
 & \frac{1}{9} \left\{ \frac{9-160-27}{18} \right\} \\
 & \frac{507}{350} + 1 \rightarrow \frac{857}{350} \\
 & \frac{1}{9} \left\{ -\frac{298}{18} \right\} \\
 & \frac{507+350}{350}
 \end{aligned}$$

$$(13) \quad 0,211 - 3,22 \div 3,222... - 1,71333...$$

$$1,2323... - 5,2$$

$$12,111... + 26$$

$$\frac{211}{1.000} - \frac{322}{700}$$

$$3 + 0,222... - (1 + 0,71333...)$$

$$1 + 0,2123... - \frac{52}{70}$$

$$12 + 0,111... + 26$$

$$\frac{211 - 3220}{1.000}$$

$$3 + \frac{2}{9} - (1 + 0,71 + 0,00333...)$$

$$1 + \frac{21}{99} - \frac{32}{70}$$

$$12 + \frac{1}{9} + 26$$

$$- \frac{3.006}{1.000}$$

$$3 + \frac{2}{9} - \left(1 + \frac{71}{100} + \frac{3}{900}\right)$$

$$3960 + 230 - 5218$$

$$108 + 1 + 239$$

$$- \frac{3.006}{1.000}$$

$$\frac{2700 + 200 - 900 - 666 - 2}{900}$$

$$- \frac{938}{990}$$

$$\frac{396}{9}$$

$$1,503$$

$$- 3.006 - 290$$

$$\frac{1339}{900}$$

$$1.000,000 \quad 958,79$$

$$\frac{396}{9}$$

$$158.797 : 1.331 \quad 9^{\circ}$$

$$57.900 \quad 900,00 \quad 396$$

$$158.797 : 1.331$$

$$51.589.686$$

$$57.900 \quad 35.600$$

$$637.599$$

$$158.797 : 35.600 \quad 396$$

$$80,75$$

$$57.900 \quad 1.331$$

$$979$$

$$158.797 : 396$$

$$579 \quad 1.331$$