Lista de exercícios 02:

(1) a) $2x - 3 < 7$

$2x < 7 + 3$

$2x < 10$

$x < \frac{10}{2}$

$x < 5$

$S = \{x \in \mathbb{R} \mid x < 5\}$

$x = 0$ ✓

$2 \cdot 0 - 3 < 7$

$0 - 3 < 7$

$-3 < 7$

$x = 5$ ✗

$2 \cdot 5 - 3 < 7$

$10 - 3 < 7$

$7 < 7$

$x = 6$ ✗

$2 \cdot 6 - 3 < 7$

$12 - 3 < 7$

$9 < 7$

$x=0$ (x) $x=3$ (✓) $x=4$

b) $3x-4 \geq 5$ | $3.0-4 \geq 5$ | $3.3-4 \geq 5$ | $3.4-4 \geq 5$

$3x \geq 5+4$ | $0-4 \geq 5$ | $9-4 \geq 5$ | $12-4 \geq 5$

$3x \geq 9$ | $-4 \geq 5$ | $5 \geq 5$ | $8 \geq 5$

$x \geq 9/3$

$x \geq 3$ $\quad S = \{x \in \mathbb{R} \mid x \geq 3\}$

c) $-1 < 4x-1 \leq 11$

$-1 < 4x-1$ | $4x-1 \leq 11$

$-1+1 < 4x$ | $4x \leq 11+1$

$0 < 4x$ | $4x \leq 12$

$x > \frac{0}{4}$ | $x \leq \frac{12}{4}$

$x > 0$ | $x \leq 3$

$S = \{x \in \mathbb{R} \mid 0 < x \leq 3\}$

$x=1$ (✓) $\quad -1 < 4.1-1 \leq 11 \quad -1 < 4-1 \leq 11 \quad -1 \leq 3 \leq 11$

$x=0$ (x) $\quad -1 < 4.0-1 \leq 11 \quad -1 < 0-1 \leq 11 \quad -1 < -1 \leq 11$

$x=2$ (✓) $\quad -1 < 4.2-1 \leq 11 \quad -1 < 8-1 \leq 11 \quad -1 < 7 \leq 11$

(2) a) $\frac{1}{2}x + \frac{1}{3} = 1$

$6 \cdot \frac{1}{2}x + 6 \cdot \frac{1}{3} = 6.1$

$3.1x + 2.1 = 6$

$3x + 2 = 6$

$3x = 6-2$

$3x = 4$

$x = 4/3$

b) $\frac{2x-3}{4} + 5 = 3x$

$4 \cdot \frac{2x-3}{4} + 4.5 = 4.3x$

$2x-3+20 = 12x$

$2x-12x = 3-20$

$-10x = -17 \cdot (-1)$

$10x = 17$

$x = \frac{17}{10}$

c) $\frac{t+5}{8} - \frac{t-2}{2} = \frac{1}{3}$

$24 \cdot \frac{(t+5)}{8} - 24 \cdot \frac{(t-2)}{2} = 24 \cdot \frac{1}{3}$

$3(t+5) - 12(t-2) = 8$

$3t+15-12t+24 = 8$

$3t-12t = 8-15-24$

$-9t = -31 \cdot (-1)$

$9t = 31$

$t = \frac{31}{9}$

③ a) $4x + 5 > 2x - 3$

$4x - 2x > -3 - 5$

$2x > -8$

$x > \frac{-8}{2}$

$x > -4$

$S = \{x \in \mathbb{R} / x > -4\}$

b) $5(x+3) - 2(x+1) \leq 2x + 3$

$5x + 15 - 2x - 2 \leq 2x + 3$

$5x - 2x - 2x \leq 3 + 2 - 15$

$x \leq -10$

$S = \{x \in \mathbb{R} / x \leq -10\}$

c) $3(x+1) - 2 \geq 5(x-1) - 3(2x-1)$

$3x + 3 - 2 \geq 5x - 5 - 6x + 3$

$3x - 5x + 6x \geq -5 + 3 + 2 - 3$

$4x \geq -3$

$x \geq \frac{-3}{4}$

$S = \{x \in \mathbb{R} / x \geq \frac{-3}{4}\}$

d) $\frac{x-1}{2} - \frac{x-3}{4} \geq 1$

$\frac{4 \cdot (x-1)}{2} - \frac{4 \cdot (x-3)}{4} \geq 4 \cdot 1$

$2(x-1) - (x-3) \geq 4$

$2x - 2 - x + 3 \geq 4$

$2x - x \geq 4 + 2 - 3$

$x \geq 3$

$S = \{x \in \mathbb{R} / x \geq 3\}$

e) $\frac{2x-3}{2} - \frac{5-3x}{3} < 3x - \frac{1}{6}$

$\frac{6 \cdot (2x-3)}{2} - \frac{6 \cdot (5-3x)}{3} < 6 \cdot 3x - 6 \cdot \frac{1}{6}$

$3(2x-3) - 2(5-3x) < 18x - 1$

$6x - 9 - 10 + 6x < 18x - 1$

$6x + 6x - 18x < -1 + 10 + 9$

$-6x < 18 \cdot (-1)$

$6x < -18$

$x < \frac{-18}{6}$

$x < -3$

$S = \{x \in \mathbb{R} / x < -3\}$

f) $-2 < 3x - 1 < 4$

$-2 < 3x - 1$ $\quad$ $3x - 1 < 4$

$-2 + 1 < 3x$ $\quad$ $3x < 4 + 1$

$-1 < 3x$ $\quad$ $3x < 5$

$x > -\frac{1}{3}$ $\quad$ $x < \frac{5}{3}$

$S = \{x \in \mathbb{R} \mid -\frac{1}{3} < x < \frac{5}{3}\}$

g) $-3 < 3x - 2 < x$

$-3 < 3x - 2$ $\quad$ $3x - 2 < x$

$-3 + 2 < 3x$ $\quad$ $3x - x < 2$

$-1 < 3x$ $\quad$ $2x < 2$

$x > \frac{3}{-1}$ $\quad$ $x < \frac{2}{2}$

$x < 1$

$S = \{x \in \mathbb{R} \mid -3 < x < 1\}$

h) $x + 1 \leq 7 - 3x < \frac{x}{2} - 1$

$x + 1 \leq 7 - 3x$ $\quad$ $7 - 3x < \frac{x}{2} - 1$

$x + 3x \leq 7 - 1$ $\quad$ $2 \cdot 7 - 2 \cdot (3x) < 2 \cdot \frac{(x)}{2} - 2 \cdot (-1)$

$4x \leq 6$ $\quad$ $14 - 6x < x - 2$

$x \leq \frac{6}{4}$ $:2$ $\quad$ $-6x - x < -2 - 14$

$x \leq \frac{3}{2}$ $\quad 1{,}5$ $\quad$ $-7x < -16$ (-1)

$7x > 16$

$x > \frac{16}{7}$

$S = \{\emptyset\}$

i) $1 > \frac{3y - 1}{4} > -1$

$1 > \frac{3y - 1}{4}$ $\quad$ $\frac{3y - 1}{4} > -1$

$4 \cdot 1 > 4 \cdot \frac{(3y - 1)}{4}$ $\quad$ $4 \cdot \frac{(3y - 1)}{4} > 4 \cdot (-1)$

$4 > 3y - 1$ $\quad$ $3y - 1 > -4$

$3y < 4 + 1$ $\quad$ $3y > -4 + 1$

$3y < 5$ $\quad$ $3y > -3$

$y < \frac{5}{3}$ $\quad$ $y > \frac{-3}{3}$

$y > -1$

$S = \{-1, \frac{5}{3}\}$

j) $x + 1 < x + 2$

$1 < 2$

$x \in \mathbb{R}$

k) $x + 1 > x + 2$

$1 > 2$

$S = \{\emptyset\}$

4) a) $|x-6|>3$

d) $|x-(-2)|=5$

5) a) $|-5|+|-2|$
$5+2$
$=7$

b) $|a|, a<0$
$=a$

c) $|-5+8|$
$|3|$
$=3$

d) $|-a|$
$=a$

e) $|-a|, a>0$
$=a$

f) $|2a|-|3a| = 2.|a| - 3.|a|$
$(2-3).|a|$
$-1.|a| = -a$

6) a) $|x-1|=4$
$x-1=4$ ou $x-1=-4$
$x=4+1$ $x=-4+1$
$x=5$ $x=-3$
$S=\{-3,5\}$

b) $|x|=2$
$x=-2$ ou $x=2$
$S=\{-2,2\}$

c) $|x-1|=$ negativo $3-\pi$
vazio

d) $|x-1|=|x-4|$
$x-1=x-4$ ou $x-1=-(x-4)$
$-1=-4$ $x-1=-x+4$
$\emptyset$ $x+x=+4+1$
$2x=5$
$x=5/2$
$S=\{5/2\}$

e) $|2x-1|=1$
$2x-1=1$ ou $2x-1=-1$
$2x=1+1$ $2x=-1+1$
$2x=2$ $2x=0$
$x=\frac{2}{2}$ $x=0/2$
$x=1$ $x=0$
$S=\{0,1\}$

f) $|x-3|=x-4$
$x-3=x-4$ ou $x-3=-(x-4)$
$-3=-4$ $x-3=-x+4$
$\emptyset$ $x+x=+4+3$
$2x=7$
$x=7/2$
$x-3<0$
$x<3$
$\emptyset$

6) $|x| = 4x+1$

$x = 4x+1$ ou $x = -(4x+1)$

$x-4x = 1$ | $x = -4x-1$

$-3x = 1\ (-1)$ | $x+4x = -1$

$3x = -1$ | $5x = -1$

$x = -1/3$ | $x = -1/5$

$x \geq 0$ | $S = \{-1/5\}$

$\emptyset$

7) a) $|x| \leq 2$

$-2 \leq x \leq 2$

$S = [-2, 2]$

b) $|x| \geq 2$

$x \geq 2$ ou $x \leq -2$

$S = (-\infty, 2] \cup [2, +\infty)$

c) $|x-1| < 4$

$-4 < x-1 < 4$

$-4+1 < x < 4+1$

$-3 < x < 5$

$S = (-3, 5)$

d) $\frac{|x+2|}{3} \geq 3$

$\frac{x+2}{3} \geq 3$ ou $\frac{x+2}{3} \leq -3$

$3\left(\frac{x+2}{3}\right) \geq 3.3$ | $3\left(\frac{x+2}{3}\right) \leq -3.3$

$x+2 \geq 9$ | $x+2 \leq -9$

$x \geq 9-2$ | $x \leq -9-2$

$x \geq 7$ | $x \leq -11$

$S = (-\infty, -11] \cup [7, +\infty)$

e) $|x-1| > 3-\pi$

$x \in \mathbb{R}$

f) $|5x+4| \geq 4$

$5x+4 \geq 4$ ou $5x+4 \leq -4$

$5x \geq 4-4$ | $5x \leq -4-4$

$5x \geq 0$ | $5x \leq -8$

$x \geq 0/5$ | $x \leq -8/5$

$x \geq 0$

$S = (-\infty, -\frac{8}{5}] \cup [0, \infty)$

g) $|4-3x|-2 < 4$

$|4-3x| < 4+2$

$|4-3x < 6$

$-6 < 4-3x < 6$

$-6-4 < -3x < 6-4$

$-10 < -3x < 2$

$\frac{-10}{-3} < x < \frac{2}{-3}$

$\frac{10}{3} < x < \frac{2}{-3}$

$S = \left(\frac{10}{3}, -\frac{2}{3}\right)$

h) $|2x-1| > 3,6$

$2x-1 > 3,6$ ou $2x-1 < -3,6$

$2x > 3,6+1$ $\quad 2x < -3,6+1$

$2x > 4,6$ $\quad 2x < -2,6$

$x > \frac{4,6}{2}$ $\quad x < \frac{-2,6}{2}$

$x > 2,3$ $\quad x < -1,3$

$x > \frac{23}{10}$ $\quad x < -\frac{13}{10}$

$S = (-\infty, -\frac{13}{10}) \cup (\frac{23}{10}, +\infty)$

i) $|x+3| \leq 5$

$-5 \leq x+3 \leq 5$

$-5-3 \leq x \leq 5-3$

$-8 \leq x \leq 2$

$S = [-8, 2]$

j) $|3-2x|+2 > 5$

$|3-2x| > 5-2$

$|3-2x| > 3$

$3-2x > 3$ ou $3-2x < -3$

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

$-2x > 0 \cdot (-1)$ $\quad -2x < -6 \cdot (-1)$

$2x < 0$ $\quad 2x > 6$

$x < 0/2$ $\quad x > 6/2$

$x < 0$ $\quad x > 3$

$S = (-\infty, 0) \cup (3, +\infty)$