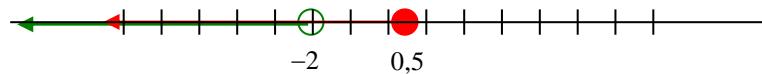


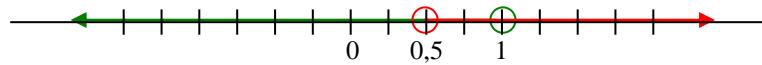
INECUACIONES Y SISTEMAS DE INECUACIONES

2. Resuelve los siguientes **sistemas de inecuaciones de primer grado**, tanto analíticamente como gráficamente:

$$(1) \begin{cases} 3x + 5 < x + 1 \\ -6x + 1 \geq -2 \end{cases} \rightarrow \begin{cases} 2x < -4 \\ -6x \geq -3 \end{cases} \rightarrow \begin{cases} x < -2 \\ x \leq \frac{1}{2} \end{cases} \Rightarrow x \in (-\infty, -2)$$

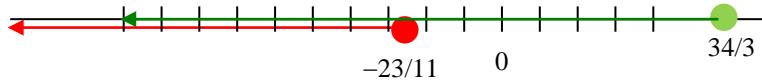


$$(2) \begin{cases} 2(x+3) - 3x > x + 4 \\ -3x + 5 < x + 3 \end{cases} \rightarrow \begin{cases} -2x > -2 \\ -4x < -2 \end{cases} \rightarrow \begin{cases} x < 1 \\ x > \frac{1}{2} \end{cases} \Rightarrow x \in \left(\frac{1}{2}, 1\right)$$

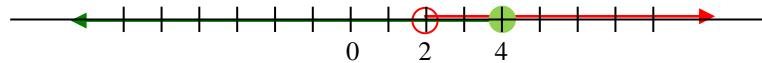


$$(3) \begin{cases} \frac{x+5}{2} \leq \frac{3x-1}{-5} \\ \frac{2(x-1)}{3} - 5 \leq \frac{x}{6} \end{cases} \rightarrow \begin{cases} -5(x+5) \geq 2(3x-1) \\ 4(x-1) - 30 \leq x \end{cases} \rightarrow \begin{cases} -5x - 25 \geq 6x - 2 \\ 4x - 4 - 30 \leq x \end{cases} \rightarrow \begin{cases} -11x \geq 23 \\ 3x \leq 34 \end{cases}$$

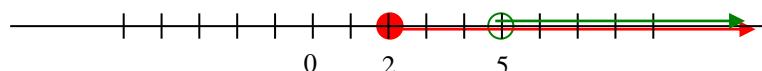
$$\rightarrow \begin{cases} x \leq -\frac{23}{11} \\ x \leq \frac{34}{3} \end{cases} \Rightarrow x \in (-\infty, -\frac{23}{11}]$$



$$(4) \begin{cases} 3(x-3) + 2x - 1 > 2(x-2) \\ -3(3x-1) \geq -21 - 3x \end{cases} \rightarrow \begin{cases} 3x - 9 + 2x - 1 > 2x - 4 \\ -9x + 3 \geq -21 - 3x \end{cases} \rightarrow \begin{cases} 3x > 6 \\ -6x \geq -24 \end{cases} \rightarrow \begin{cases} x > 2 \\ x \leq 4 \end{cases} \Rightarrow x \in (2, 4]$$

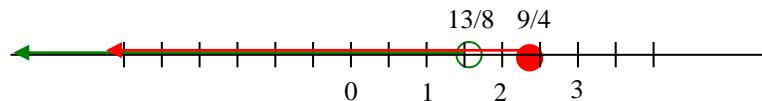


$$(5) \begin{cases} 3x - 5 + 2(x+2) \geq 2x + 5 \\ 4(2x-3) - 5 > 23 \end{cases} \rightarrow \begin{cases} 3x - 5 + 2x + 4 \geq 2x + 5 \\ 8x - 12 - 5 > 23 \end{cases} \rightarrow \begin{cases} 3x \geq 6 \\ 8x > 40 \end{cases} \rightarrow \begin{cases} x \geq 2 \\ x > 5 \end{cases} \Rightarrow x \in (5, +\infty)$$



$$(6) \begin{cases} \frac{2x-3}{4} + \frac{1}{2} < \frac{6-3x}{2} \\ \frac{4}{1+2x} \leq \frac{6}{5x-3} \end{cases} \rightarrow \begin{cases} 2x-3+2 < 2(6-3x) \\ 4(5x-3) \leq 6(1+2x) \end{cases} \rightarrow \begin{cases} 2x-3+2 < 12-6x \\ 20x-12 \leq 6+12x \end{cases} \rightarrow \begin{cases} 8x < 13 \\ 8x \leq 18 \end{cases}$$

$$\rightarrow \begin{cases} x < \frac{13}{8} \\ x \leq \frac{9}{4} \end{cases} \Rightarrow x \in \left(-\infty, \frac{13}{8}\right)$$



3. Resuelve las siguientes **inecuaciones de segundo grado**, tanto analíticamente como gráficamente:

$$(1) x^2 + x - 6 \leq 0$$

$$x^2 + x - 6 = 0 \rightarrow x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot (-6)}}{2 \cdot 1} = \frac{-1 \pm \sqrt{25}}{2} = \frac{-1 \pm 5}{2} = \begin{cases} x_1 = \frac{4}{2} = 2 \\ x_2 = \frac{-6}{2} = -3 \end{cases}$$

$$(x-2)(x+3) \leq 0$$

	-3		2
$(x-2)$	-	-	+
$(x+3)$	-	+	+
$(x-2)(x+3)$	+	-	+

$$x \in [-3, 2]$$

$$(2) (x-2)(x+1) \geq 18 \Leftrightarrow x^2 - x - 20 \geq 0$$

$$x^2 - x - 20 = 0 \rightarrow x = \frac{1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot (-20)}}{2 \cdot 1} = \frac{1 \pm \sqrt{81}}{2} = \frac{1 \pm 9}{2} = \begin{cases} x_1 = \frac{10}{2} = 5 \\ x_2 = \frac{-8}{2} = -4 \end{cases}$$

$$(x-5)(x+4) \geq 0$$

	-4		5
$(x-5)$	-	-	+
$(x+4)$	-	+	+
$(x-5)(x+4)$	+	-	+

$$x \in (-\infty, -4] \cup [5, +\infty)$$

$$(3) (x-1)^2 - (x+2)^2 + 3x^2 \leq 1 - 7x \Leftrightarrow 3x^2 + x - 4 \leq 0$$

$$3x^2 + x - 4 = 0 \rightarrow x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 3 \cdot (-4)}}{2 \cdot 3} = \frac{-1 \pm \sqrt{49}}{6} = \frac{-1 \pm 7}{6} = \begin{cases} x_1 = \frac{6}{6} = 1 \\ x_2 = \frac{-8}{6} = -\frac{4}{3} \end{cases}$$

$$3(x-1)\left(x + \frac{4}{3}\right) \leq 0$$

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

$$x \in \left[-\frac{4}{3}, 1 \right]$$

$$(4) 2x^2 \geq 5x - 3 \Leftrightarrow 2x^2 - 5x + 3 \geq 0 \rightarrow 2\left(x - \frac{3}{2}\right)(x-1) \geq 0$$

	1		$\frac{3}{2}$
$\left(x - \frac{3}{2}\right)$	-	-	+
$(x-1)$	-	+	+
$\left(x - \frac{3}{2}\right)(x-1)$	+	-	+

$$x \in (-\infty, 1] \cup [\frac{3}{2}, +\infty)$$

$$(5) \frac{x-3}{4} > (x-2)(x+7) + 17 \Leftrightarrow 4x^2 + 19x + 15 < 0 \rightarrow 4(x+1)\left(x + \frac{15}{4}\right) < 0$$

	$-\frac{15}{4}$		-1
$(x+1)$	-	-	+
$\left(x + \frac{15}{4}\right)$	-	+	+
$(x+1)\left(x + \frac{15}{4}\right)$	+	-	+

$$x \in \left(-\frac{15}{4}, -1 \right)$$

$$(6) \quad 9x^2 - 6x + 1 \leq 0 \rightarrow 9\left(x - \frac{1}{3}\right)^2 \leq 0$$

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

$$(7) \quad -5(x-6)(x+1) < 0$$

	-1		6
$(x+1)$	-	+	+
$(x-6)$	-	-	+
$(x+1)(x-6)$	+	-	+

$$x \in (-1, 6)$$

$$(8) \quad (2x+5)(x-3) \leq 0$$

	$-\frac{5}{2}$		3
$(2x+5)$	-	+	+
$(x-3)$	-	-	+
$(2x+5)(x-3)$	+	-	+

$$x \in \left[-\frac{5}{2}, 3 \right]$$

$$(9) \quad 3(2x-14)(3x+12) \geq 0$$

	-4		7
$(2x+5)$	-	-	+
$(x-3)$	-	+	+
$(2x+5)(x-3)$	+	-	+

$$x \in (-\infty, -4] \cup [7, +\infty)$$