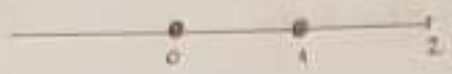
Práctica 1.- NÚMEROS REALES

Ejercicio 1.- Representar en la recta real

a) Todos los nºs reales x tales que $x(x-1)=0$

$\underbrace{x(x-1)}_{a \cdot b}=0 \Leftrightarrow x=0$ ó $x-1=0 \Leftrightarrow S=\{0,1\}$

$a \cdot b = 0 \Leftrightarrow a=0$ ó $b=0$



b) Todos los nºs reales x tales que $x^2-16=0$

$x^2-16=0 \Leftrightarrow (x-4)(x+4)=0 \Leftrightarrow x-4=0$ ó $x+4=0$

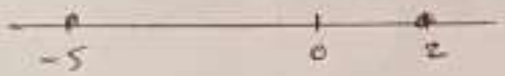
$x=4$ ó $x=-4$

$S=\{-4,4\}$

c) $\{x \in \mathbb{R} \mid (x-2)(x+5)=0\}$

$(x-2)(x+5)=0 \Leftrightarrow x-2=0$ ó $x+5=0$

$x=2$ ó $x=-5$ $\quad S=\{-5,2\}$

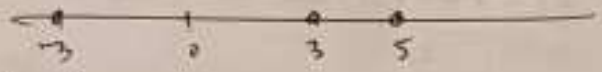


d) $\{x \in \mathbb{R} \mid (5-x)(x^2-9)=0\}$

$(5-x)(x^2-9)=0 \Leftrightarrow (5-x)(x-3)(x+3)=0 \Leftrightarrow 5-x=0$ ó $x-3=0$ ó $x+3=0$

$5=x$ ó $x=3$ ó $x=-3$

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



e) $\{x \in \mathbb{R} \mid (3-x)(x^2+15)=0\}$

$(3-x)(x^2+15)=0 \Leftrightarrow 3-x=0$ ó $(x^2+15)=0$

$3=x$ ó $x^2=-15 \Rightarrow \nexists x \mid x^2=-15$ (un nº al cuadrado siempre es ≥ 0)

$\Rightarrow S=\{3\}$

Ej 1.

f) $\{x \in \mathbb{R} \mid (x-2)(x+1)(x-5)=0\}$

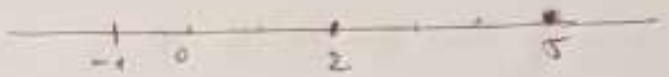
$\underbrace{(x-2)(x+1)(x-5)}_{a \cdot b \cdot c = 0}=0 \Leftrightarrow x-2=0$ ó $(x+1)=0$ ó $x-5=0$

$\Updownarrow$

$a=0$ ó $b=0$ ó $c=0$

$x=2$ ó $x=-1$ ó $x=5$

$S=\{-1, 2, 5\}$



g) $\{x \in \mathbb{R} \mid (2-3x)^2=0\}$

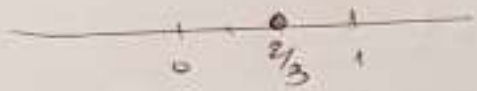
$(2-3x)^2=0 \Leftrightarrow 2-3x=0 \Rightarrow 2=3x \Rightarrow \frac{2}{3}=x$

$a^2=0$

$\Updownarrow$

$a=0$

$S=\{2/3\}$



h) $\{x \in \mathbb{R} \mid x^2+6x+9=0\}$

$\underset{a}{1}x^2+\underset{b}{6}x+\underset{c}{9}=0 \Leftrightarrow (x+3)^2=0 \Leftrightarrow x+3=0 \Rightarrow x=-3$ $\quad S=\{-3\}$

0, si no:

$x_{1,2}=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x_{1,2}=\frac{-6\pm\sqrt{6^2-4.1.9}}{2.1}=\frac{-6\pm\sqrt{0}}{2}=\frac{-6}{2}=-3$ ✓

i) $\{x \in \mathbb{R} \mid x^3+6x^2+9x=0\}$

$x^3+6x^2+9x=0 \Rightarrow \underset{a}{x}\underbrace{(x^2+6x+9)}_{b}=0 \Rightarrow x=0$ ó $x^2+6x+9=0$

$(x+3)^2=0$

$x+3=0 \Rightarrow x=-3$

$S=\{-3, 0\}$

j) $\{x \in \mathbb{R} / x^3 - 4x = 0\}$

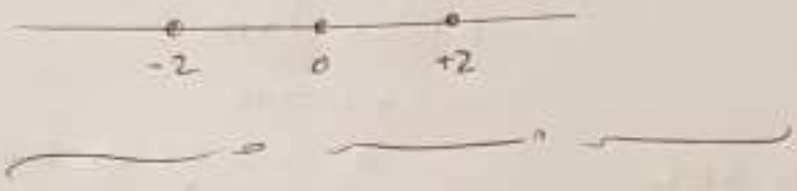
$x^3 - 4x = 0 \Rightarrow x(x^2-4) = 0 \Rightarrow x = 0$ ó $\underbrace{x^2 - 4 = 0}$

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

$x - 2 = 0$ ó $x + 2 = 0$

$x = 2$ ó $x = -2$

$S = \{-2, 0, 2\}$



Ej 2

a) Decidir si los números a y b pertenecen al conjunto C

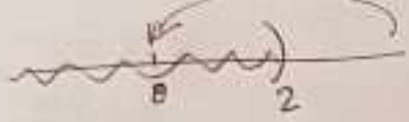
i. $C = \{x \in \mathbb{R} / 3x - 2 < 4\}$ $a = 5$; $b = 0$

$3x - 2 < 4$

$3x < 4 + 2$

$x < \frac{6}{3}$

$x < 2$



$b \in a\ C$

$a \notin C$

$3 \cdot 5 - 2 \overset{?}{<} 4$

$15 - 2 \overset{?}{<} 4$

$13 \overset{?}{<} 4$

no $\Rightarrow 5 \notin C$

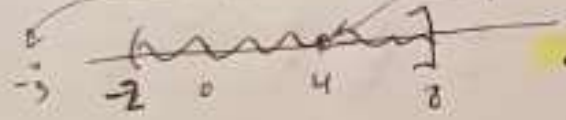
$3 \cdot 0 - 2 \overset{?}{<} 4$

$0 - 2 \overset{?}{<} 4$

$-2 \overset{?}{<} 4$ sí $\Rightarrow 0 \in C$

ii) $C = \{x \in \mathbb{R} / -2 < x \leq 8\}$ $a = -3$; $b = 4$

$\notin$ $\in$



$a \notin C$; $b \in C$

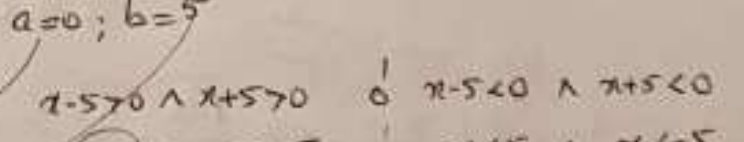
iii) $C = \{x \in \mathbb{R} / x^2 - 25 > 0\}$ $a = 0$; $b = 5$

$x^2 - 25 > 0 \Leftrightarrow \underbrace{(x-5)}_{a} \cdot \underbrace{(x+5)}_{b} > 0 \Leftrightarrow$ $x - 5 > 0 \wedge x + 5 > 0$ ó $x - 5 < 0 \wedge x + 5 < 0$

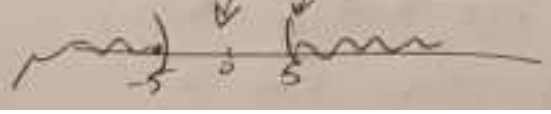
$x > 5 \wedge x > -5$ $x < 5 \wedge x < -5$

$a \cdot b > 0 \Leftrightarrow (a > 0 \wedge b > 0)$ ó $(a < 0 \wedge b < 0)$

$\cap$ $\cup$ $\cap$



$S_1 = (5, +\infty)$ $\cup$ $S_2 = (-\infty, -5)$



$\Rightarrow a \notin C \wedge b \notin C$

Ej 2 - Cont

iv) $C = \{x \in \mathbb{R} \mid x^3 - x > 10\}$ $\quad a = 5 \; ; b = -1$

$x^3 - x > 10$

$x(x^2-1) > 10 \Leftrightarrow \underbrace{x(x-1)(x+1)}_{} > 10$ $\quad a = 5 \; ; b = -1$

resolver esta inecuación es largo y complicado $\Rightarrow$

ver si $a \in C \wedge b \in C$

con $a = 5$

$5^3 - 5 \overset{?}{>} 10$

$125 - 5 \overset{?}{>} 10$

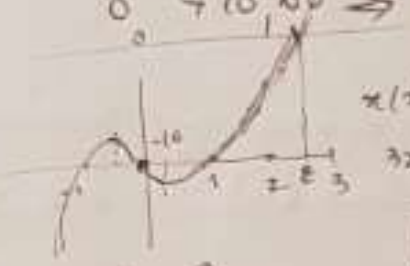
$120 \overset{?}{>} 10$ sí $\Rightarrow a \in C$

$b = -1$

$(-1)^3 - (-1) \overset{?}{>} 10$

$-1 + 1 \overset{?}{>} 10$

$0 \overset{?}{>} 10$, NO $\Rightarrow b \notin C$



$x(x^2-1)$

$3x^2 - 1 = 0$

$x^2 = 1/3$

$|x| = \sqrt{1/3}$

$2^3 - 2 \overset{?}{>} 10$

$8 - 2 \overset{?}{>} 10$

$6 \overset{?}{>} 10$, no

$3^3 - 3 \overset{?}{>} 10$

$27 - 3 \overset{?}{>} 10$

$24 > 10$

v) $C = \{x \in \mathbb{R} \mid 5x - 3 > \frac{1}{2} - x\}$ $\quad a = -2, b = 1$

$5x - 3 > \frac{1}{2} - x$

$5x + x > \frac{1}{2} + 3$

$6x > 7/2$

$\left[x > \frac{7}{2} \cdot \frac{1}{6} = \frac{7}{12}\right]$

$S = (7/12, +\infty)$

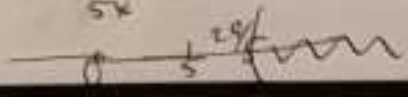
$a \notin C \wedge b \in C$

Ojo! mal copiado Ejercicio

vi) $C = \{x \in \mathbb{R} \mid \frac{x-1}{3} - x \leq \frac{1-x}{4} - 3\}$; $a = 9$; $b = 4$ $\quad a \in C, b \notin C$

$\frac{x-1}{3} - x \leq \frac{1-x}{4} - 3 \Leftrightarrow \frac{x-1-3x}{3} \leq \frac{1-x-12}{4} \Rightarrow 4(\underbrace{x-1-3x}_{4(-1-2x)}) \leq 3(\underbrace{1-x-12}_{3(-11-x)}) \Rightarrow$

$-4 - 8x \leq -33 - 3x \Rightarrow \underbrace{-4+33}_{29} \leq \underbrace{-3x+8x}_{5x} \Rightarrow 29 \leq 5x \Rightarrow \boxed{\frac{29}{5} \leq x}$



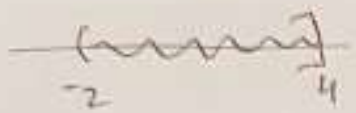
5,8 $\leq x$

b. Dar dos nros que pertenezcan al conjunto A y dos que no pertenezcan

i) $A = \{x \in \mathbb{R} \mid -2 < x \leq 4\}$

$-1 \in A$; $4 \in A$

$-2 \notin A$; $5 \notin A$

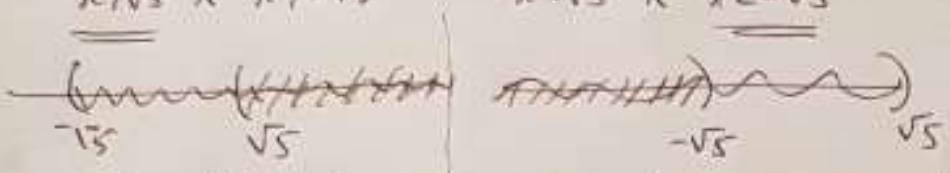


ii) $A = \{x \in \mathbb{R} \mid x^2 > 5\}$

$$x^2 - 5 > 0 \Rightarrow \underbrace{(x+\sqrt{5})}_{a}\underbrace{(x+\sqrt{5})}_{b} > 0$$

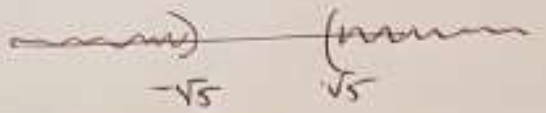
$x - \sqrt{5} > 0 \wedge x + \sqrt{5} > 0$ ó $x - \sqrt{5} < 0 \wedge x + \sqrt{5} < 0$

$\underline{\underline{x > \sqrt{5}}} \wedge x > -\sqrt{5}$ | $x < \sqrt{5} \wedge \underline{\underline{x < -\sqrt{5}}}$



$S_1 = (\sqrt{5}, +\infty) \cup S_2 = (-\infty, -\sqrt{5}) = S$

$S =$



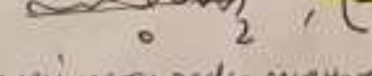
Entonces: $-3 \in A \wedge 3 \in A$

$-1 \notin A \wedge 0 \notin A$

Ejercicio 3 - Práctica 1

Escribir como un intervalo ó una unión de intervalos y representar en la recta real

a. Todos los números reales menores que 2

$x < 2$;  ; $(-\infty, 2)$

b) Todos los números reales mayores ó iguales que -1

$x \geq -1$;  ; $[-1, \infty)$

Cont - Ej 3 - Práctica 1

c. Todos los números reales mayores que -3 y menores o iguales que 7

$-3 < x \leq 7$ $(-3, 7]$

d. $\{x \in \mathbb{R} \mid x \geq -3\}$

$x \geq -3$ $[-3, +\infty)$

e. $\{x \in \mathbb{R} \mid x < 6\}$

$x < 6$ $(-\infty, 6)$

f. $\{x \in \mathbb{R} \mid -1 \leq x < 4\}$

$-1 \leq x < 4$ $[-1, 4)$

g. $\{x \in \mathbb{R} \mid x < -1 \text{ ó } x > 5\}$

$x < -1$ ó $x > 5$ $(-\infty, -1) \cup (5, +\infty)$

Ejercicio 4 -
Escribir como un intervalo o una unión de intervalos y representar en la recta real

a. $\{x \in \mathbb{R} \mid 2x - 1 < 0\}$

$2x - 1 < 0$
$2x < 1$
$x < 1/2$

$(-\infty, 1/2)$

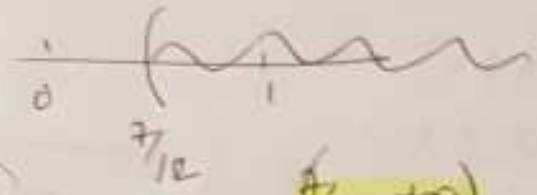
Cont - Ej 4

b) $\{x \in \mathbb{R} \mid 5x-3 > \frac{1}{2}-x\}$

$5x-3 > 1/2 - x$

$5x+x > 1/2+3$

$6x > 7/2 \Rightarrow x > \frac{7}{12}$



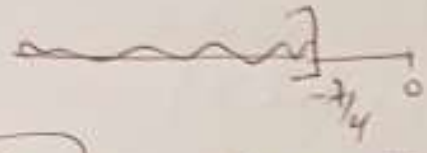
$(7/12, +\infty)$

c) $\{x \in \mathbb{R} \mid 3x+2 \leq -x-5\}$

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

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

$4x \leq -7 \Rightarrow \boxed{x \leq -7/4}$



$(-\infty, -7/4]$

d) $\{x \in \mathbb{R} \mid 5-x < -x+3\}$

$5 \underbrace{-x+x}_{0} < 3$

$5 < 3 \Rightarrow$ falso $\Rightarrow \nexists x \Rightarrow$ ~~$S=\{\}$~~

$S = \phi$ conjunto vacío

e) $\{x \in \mathbb{R} \mid 3x-2 \leq 3x+5\}$

$\underbrace{3x-3x}_{0} \leq 5+2$

$0 \leq 7$, sí! $\forall x \in \mathbb{R} \Rightarrow S = \mathbb{R} \Rightarrow (-\infty, +\infty)$

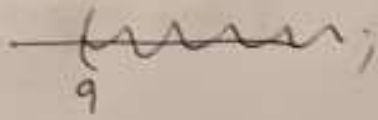
f) $\{x \in \mathbb{R} \mid \frac{x-1}{2} - x < \frac{1-x}{4} - 3\} \Rightarrow \frac{\overbrace{x-1-2x}^{-x-1}}{2} < \frac{\overbrace{1-x-12}^{-11-x}}{4} \Rightarrow 4(-x-1) < 2(-11-x)$

$\Rightarrow -4x-4 < -22-2x$

$-4+22 < 4x-2x$

$18 < 2x$

$\boxed{9 < x}$



; $(9, +\infty)$

Cont Ej 4 - Práctica 1

a) $\{x \in \mathbb{R} / 3 < 2x-1 \leq 7\} = (2,4)$

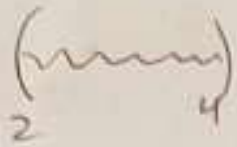
$3 < 2x-1 \leq 7$

$3+1 < 2x-1+1 \leq 7+1$

$4 < 2x \leq 8$

$\frac{4}{2} < \frac{2x}{2} \leq \frac{8}{2}$

$\boxed{2 < x < 4}$



$(2,4)$

b) $\{x \in \mathbb{R} / -11 \leq 1-3x < -2\}$

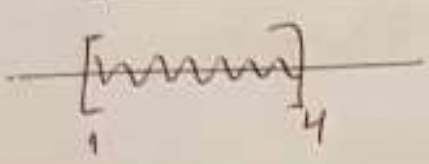
$-11 \leq 1-3x < -2$; sumamos 1 en toda la desigualdad

$-11+1 \leq \cancel{-1+1}-3x \leq -1-2$

$-12 \leq -3x \leq -3$; dividimos por -3 a toda la desigualdad. ojo! recordar de cambiar los símbolos de desigualdad!

$(-12)(-\frac{1}{3}) \geq (-1/3)(-3x) \geq (-1/3)(-3)$

$\boxed{4 \geq x \geq 1}$ $\Rightarrow [1,4]$



Ejercicio 5. Juan salió de su casa con \$120. Gastó \$5 en viaje de Fran y \$25 en el almuerzo. En la librería hay una oferta de cuadernos a \$15 si debe reservar \$5 para regresar ¿cuántos cuadernos puede comprar?

viaje ida	\$5	120	85 | 15
almuerzo	\$25	− 35	10 | 5
viaje vuelta	\$5	85	
	\$35	le queda	

Podría comprar 5 y le costarían \$10

Ejercicio 6 -

Escribir como un intervalo o una unión de intervalos y representar en la recta real

a) $\{x \in \mathbb{R} \mid x(x-1) > 0\}$

$$x(x-1) > 0 \Leftrightarrow (x > 0 \wedge x-1 > 0) \text{ ó } (x < 0 \wedge x-1 < 0)$$

$$x > 0 \wedge x > 1 \qquad\qquad x < 0 \wedge x < 1$$

$$\cap \qquad\qquad \cup \qquad\qquad \cap$$

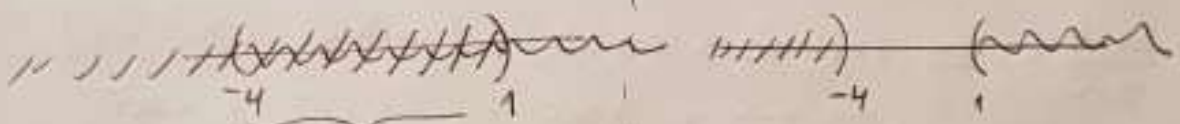
$$S_1 = (1, +\infty) \qquad \cup \qquad S_2 = (-\infty, 0)$$

$$\boxed{S = (-\infty, 0) \cup (1, +\infty)}$$

b) $\{x \in \mathbb{R} \mid (x-1)(x+4) < 0\}$

$$(x-1)(x+4) < 0 \Rightarrow (x-1 < 0 \wedge x+4 > 0) \text{ ó } (x-1 > 0 \wedge x+4 < 0)$$

$$x < 1 \wedge x > -4 \qquad\qquad x > 1 \wedge x < -4$$



$$S_1 = (-4, 1) \qquad \cup \qquad S_2 = \phi$$

$$\boxed{S = S_1 \cup S_2 = (-4, 1)}$$

c) $\{x \in \mathbb{R} \mid x^2 \geq x\}$

$x^2 - x \geq 0$

$x(x-1) \geq 0 \Rightarrow$ ver a) $(-\infty, 0] \cup [1, +\infty) = S$

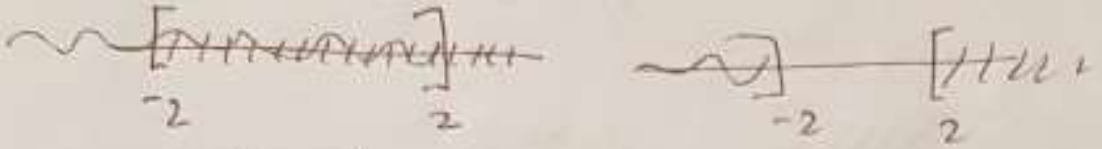
Cont Ej 6

d) $\{x \in \mathbb{R} \mid x^2 - 4 \leq 0\}$

$x^2 - 4 \leq 0 \Rightarrow (x-2)(x+2) \leq 0$

$\Rightarrow (x-2 \leq 0 \wedge x+2 \geq 0)$ ó $(x-2 \geq 0 \wedge x+2 \leq 0)$

$x \leq 2 \wedge x \geq -2$ ó $x \geq 2 \wedge x \leq -2$



$S_1 = [-2, 2] \quad \cup \quad S_2 = \phi$

$S = S_1 \cup S_2 = [-2,2] \cup \phi = [-2,2]$

Ejercicio 7.

Escribir como un intervalo o una unión de intervalos y representar en la recta real

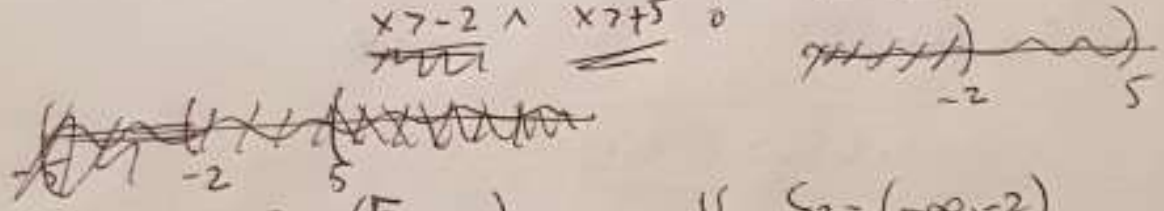
$\frac{a}{b} > 0 \Leftrightarrow (a>0 \wedge b>0)$ ó $(a<0 \wedge b<0)$

a) $\{x \in \mathbb{R} \mid \frac{2x+4}{x-5} > 0\}$

$\Rightarrow \frac{2x+4}{x-5} > 0 \Leftrightarrow (2x+4>0 \wedge x-5>0)$ ó $(2x+4<0 \wedge x-5<0)$

$2x > -4 \wedge x > +5$ ó $x < -2 \wedge x < 5$

$x > -2 \wedge x > +5$ ó



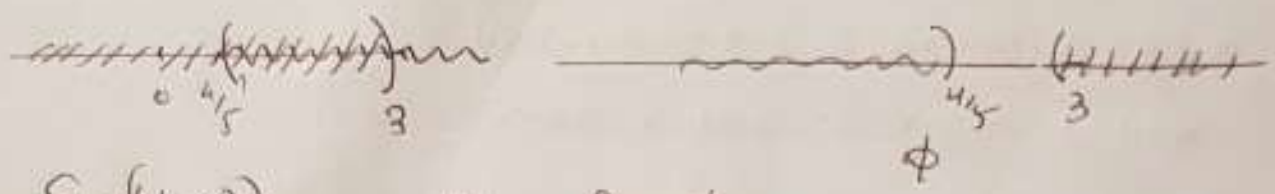
$S_1 = (5, +\infty) \quad \cup \quad S_2 = (-\infty, -2)$

$S = S_1 \cup S_2 = (-\infty, -2) \cup (5, +\infty)$

b) $\left\{ x \in \mathbb{R} \mid \frac{3-x}{5x-4} > 0 \right\} \Rightarrow \frac{3-x}{5x-4} > 0 \Leftrightarrow$

$(3-x>0 \wedge 5x-4>0)$ ó $(3-x<0 \wedge 5x-4<0)$

$3>x \wedge x>4/5$ $\qquad$ $3<x \wedge x<4/5$



$S_1 = (4/5, 3) \quad \cup \quad S_2 = \phi$ conjunto vacío

$$\boxed{S = S_1 \cup S_2 = (4/5, 3) \cup \phi = (4/5, 3)}$$

Ej 7 c) $\underbrace{\left\{ x \in \mathbb{R} \mid \frac{x}{3-2x} < 0 \right\}}$

x es un número que pertenece (∈) al conjunto de los números reales $\mathbb{R}$

y tal que $\frac{x}{3-2x} < 0$ $\qquad$ $\frac{a}{b} < 0 \Rightarrow (a<0 \wedge b>0)$ ó $(a>0 \wedge b<0)$

$b \neq 0$!

~~vamos~~:

$\frac{x}{3-2x} < 0 \Rightarrow$ entonces ó implica que

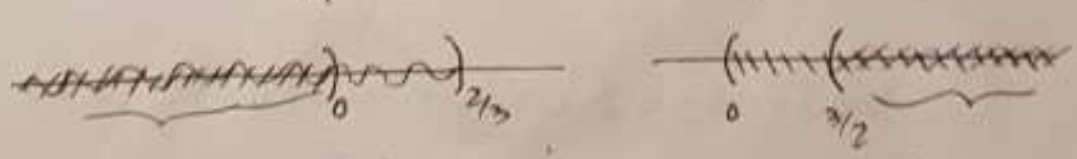
y como intersección $\qquad$ unión

$(x<0 \wedge 3-2x>0)$ ó $(x>0 \wedge 3-2x<0)$

$x<0 \wedge 3>2x \qquad x>0 \wedge 3<2x$

$(x<0 \wedge 3/2 > x)$ ó $(x>0 \wedge \frac{3}{2} < x)$

$S_1 \qquad S_2$



$S_1 = (-\infty, 0) \quad \cup \quad S_2 = (3/2, +\infty)$

$$S = S_1 \cup S_2 = (-\infty, 0) \cup (3/2, +\infty)$$

Cont. Ej 7 - Práctica 1

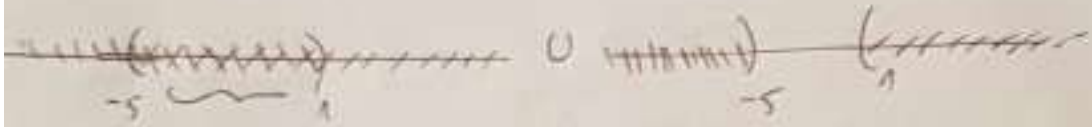
7) d)

$\left\{x \in \mathbb{R} \,/\, \frac{x-1}{x+5} < 0\right\} \rightarrow \frac{a}{b} < 0 \Rightarrow (a<0 \wedge b>0) \text{ ó } (a>0 \wedge b<0)$

$b \neq 0$

$\Rightarrow (x-1<0 \wedge x+5>0) \text{ ó } (x-1>0 \wedge x+5<0)$

$x<1 \wedge x>-5 \text{ ó } x>1 \wedge x<-5$



$S_1 = (-5,1) \quad \cup \quad S_2 = \emptyset$

$S = S_1 \cup S_2 = (-5,1) \cup \emptyset = (-5,1)$

---

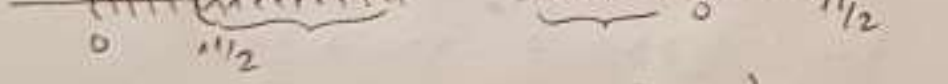
7 e)

$\left\{x \in \mathbb{R} \,/\, \frac{11}{x} < 2\right\} \qquad \frac{11}{x} - 2 < 0 \Rightarrow \underbrace{\frac{11-2x}{x} < 0}_{\frac{a}{b}<0}$

$\Rightarrow (11-2x<0 \wedge x>0) \text{ ó } (11-2x>0 \wedge x<0)$

$11<2x \wedge x>0 \text{ ó } 11>2x \wedge x<0$

$\frac{11}{2}<x \wedge x>0 \text{ ó } 11/2>x \wedge x<0$



$S_1 = (11/2, +\infty) \quad \cup \quad S_2 = (-\infty, 0)$

$S = S_1 \cup S_2 = S_2 \cup S_1 = (-\infty, 0) \cup (11/2, +\infty)$

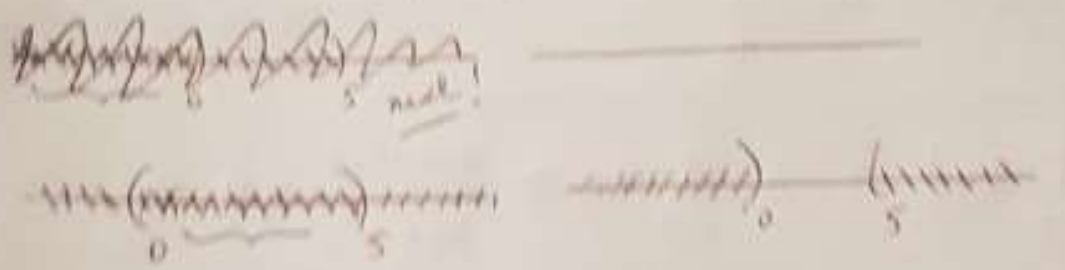
7 f) $\{x \in \mathbb{R} \,/\, \frac{15}{x} > 3\}$; $\frac{15}{x} > 3 \Leftrightarrow \frac{15}{x} - 3 > 0 \Rightarrow \frac{15-3x}{x} > 0$

$\Rightarrow (15-3x > 0 \wedge x > 0) \text{ ó } (15-3x < 0 \wedge x < 0)$ $\qquad \frac{a}{b} > 0$

$15 > 3x \wedge x > 0 \text{ ó } 15 < 3x \wedge x < 0$

$\frac{15}{3} > x \wedge x > 0 \text{ ó } \frac{15}{3} < x \wedge x < 0$

$(5 > x \wedge x > 0) \text{ ó } (5 < x \wedge x < 0)$



$S_1 = (0,5) \quad \cup \quad S_2 = \phi$

$S = S_1 \cup S_2 = (0,5) \cup \phi = (0,5)$

---

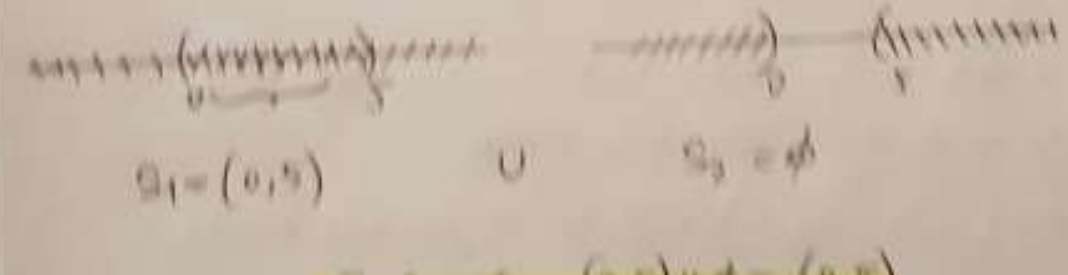
7 g) $\{x \in \mathbb{R} \,/\, \frac{25}{x} + 3 > -2\}$ transformamos la expresión para llevarla a la forma $\frac{a}{b} > 0$

$\frac{25}{x} + 3 > -2 \Leftrightarrow \frac{25}{x} + 3 + 2 > 0 \Leftrightarrow \frac{25}{x} + 5 > 0 \Leftrightarrow \frac{25+5x}{x} > 0$

$\Rightarrow (25+5x > 0 \wedge x > 0) \text{ ó } (25+5x < 0 \wedge x < 0)$

$25 > 5x \wedge x > 0 \qquad 25 < 5x \wedge x < 0$

$5 > x \wedge x > 0 \qquad 5 < x \wedge x < 0$



$S_1 = (0,5) \quad \cup \quad S_2 = \phi$

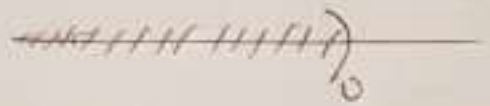
$S = S_1 \cup S_2 = (0,5) \cup \phi = (0,5)$

Cont Ej 7 - Práctica 1

7 h) $\left\{x \in \mathbb{R} \,/\, \frac{4}{x} \leq \frac{1}{x}\right\} \Rightarrow \frac{4}{x} \leq \frac{1}{x} \Rightarrow \overbrace{\frac{4}{x} - \frac{1}{x}}^{\frac{4-1}{x}} \leq 0 \Rightarrow \frac{3}{x} \leq 0$

$\frac{3}{x} \leq 0$, como $3>0$, tiene que ser $x<0$ (no puede ser igual, porque x está en el denominador)

$\frac{3}{x} \leq 0 \Rightarrow x<0$ $\quad S=(-\infty,0)$



7 i) $\left\{x \in \mathbb{R} \,/\, 4 - \frac{8}{x-1} < 0\right\}$; $\frac{4}{1} - \frac{8}{x-1} < 0 \Rightarrow \frac{4(x-1)-8}{x-1} < 0 \Rightarrow$

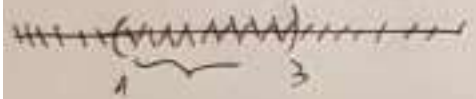
$\frac{4x-4-8}{x-1} < 0 \Rightarrow \frac{4x-12}{x-1} < 0$; $\left(\frac{a}{b} < 0\right)$

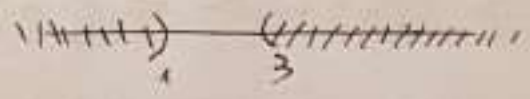
$\Rightarrow (4x-12<0 \wedge x-1>0)$ ó $(4x-12>0 \wedge x-1<0)$

$4x<12 \wedge x>1$ ó $4x>12 \wedge x<1$

$x<12/4 \wedge x>1$ ó $x>12/4 \wedge x<1$

$x<3 \wedge x>1$ ó $x>3 \wedge x<1$





$S_1=(1,3) \quad \cup \quad S_2=\phi$

$$S=S_1 \cup S_2=(1,3) \cup \phi=(1,3)$$

Verificación: Elijo un x de S, por ej. $x=2 \in (1,3)$ y lo reemplazo en la desigualdad: y verifico que da un resultado cierto

$4 - \frac{8}{2-1} \overset{?}{<} 0 \Rightarrow 4-8 \overset{?}{<} 0 \Rightarrow -4 \overset{?}{<} 0$, sí. $\Rightarrow$ para $x=2 \in (1,3)$ se verifica.

Todo indica que $(1,3)$ es la solución.

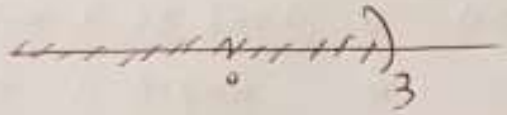
7 j) $\left\{x \in \mathbb{R} \mid \frac{x+2}{x-3} < 1\right\}$; $\frac{x+2}{x-3} < 1 \Rightarrow \frac{x+2}{x-3} - \frac{1}{1} < 0 \Rightarrow$

$$\Rightarrow \frac{(x+2)-(x-3)}{(x-3)} < 0 \Rightarrow \frac{\cancel{x}+2-\cancel{x}+3}{x-3} < 0 \Rightarrow \frac{5}{x-3} < 0$$

Entonces, es del tipo $\frac{5}{a} < 0 \Rightarrow a < 0$! pues $5 > 0$

$\Rightarrow x-3 < 0 \Rightarrow x < 3$

$S = (-\infty, 3)$



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7 k) $\left\{x \in \mathbb{R} \mid \frac{-9}{x+2} > 3\right\}$; transformamos a algo tipo $\frac{a}{b} > 0$

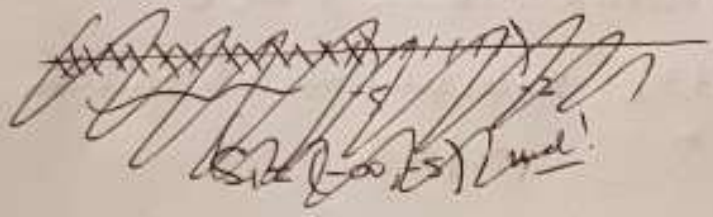
$$\frac{-9}{x+2} > 3 \Rightarrow \frac{-9}{x+2} - 3 > 0 \Rightarrow \frac{-9-3(x+2)}{x+2} > 0 \Rightarrow \frac{-9-3x-6}{x+2} > 0 \Rightarrow$$

$$\Rightarrow \frac{-15-3x}{x+2} > 0 \Rightarrow (-15-3x > 0 \wedge x+2 > 0) \text{ ó } (-15-3x < 0 \wedge x+2 < 0)$$

$-15 > 3x \wedge x > -2$ ó $-15 < 3x \wedge x < -2$

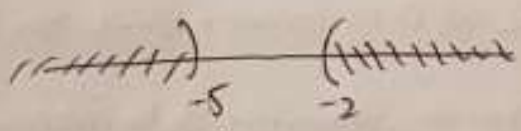
$\frac{-15}{3} > x \wedge x > -2$ ó $-15/3 < x \wedge x < -2$

$-5 > x \wedge x > -2$ ó $-5 < x \wedge x < -2$



$S_1 = (-\infty, -5)$ mal!

$\cup$



$S_1 = \phi \quad \cup \quad S_2 = (-5, -2)$

$S = S_1 \cup S_2 = \phi \cup S_2 = \phi \cup (-5,-2) = (-5,-2)$

Cont Ej 7 - Práctica 1

7e) $\left\{ x \in \mathbb{R} \,/\, \frac{7x+5}{x-1} \leq 3 \right\}$; transformamos en algo tipo $\frac{a}{b} \leq 0$

$$\frac{7x+5}{x-1} \leq 3 \Rightarrow \frac{7x+5}{x-1} - 3 \leq 0 \Rightarrow \frac{(7x+5) - 3(x-1)}{x-1} \leq 0 \Rightarrow$$

$$\Rightarrow \frac{7x+5-3x+3}{x-1} \leq 0 \Rightarrow \frac{4x+8}{x-1} \leq 0$$

$\frac{a}{b} \leq 0$

(ojo: $x-1 \neq 0$)

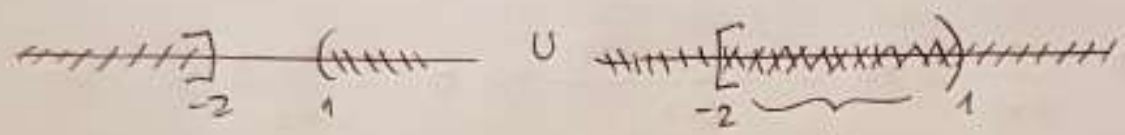
$\Rightarrow$ pueden pasar estos 2 casos:

$$(4x+8 \leq 0 \wedge x-1 > 0) \text{ ó } (4x+8 \geq 0 \wedge x-1 < 0)$$

$$4x \leq -8 \wedge x > 1 \quad \text{ó} \quad 4x \geq -8 \wedge x < 1$$

$$x \leq -8/4 \wedge x > 1 \quad \text{ó} \quad x \geq -8/4 \wedge x < 1$$

$$x \leq -2 \wedge x > 1 \quad \text{ó} \quad x \geq -2 \wedge x < 1$$

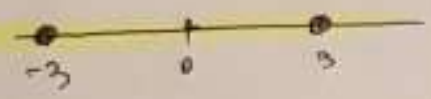


$S_1 = \phi \quad \cup \quad S_2 = [-2, 1)$

$$S = S_1 \cup S_2 = \phi \cup S_2 = S_2 = [-2, 1)$$

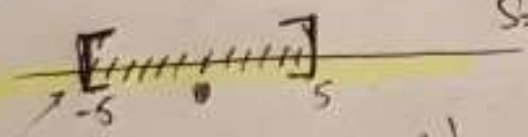
Ejercicio 8 - Representar en la recta real

a. Todos los números reales que están a distancia 3 del 0



$S = \{-3, 3\}$; son las soluciones de la ecuación $|x| = 3$

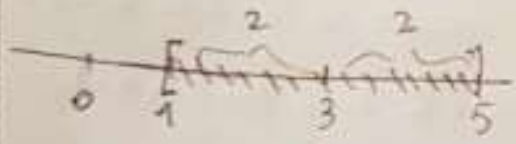
b. Todos los números reales cuya distancia al 0 es menor ó igual que 5



$S = (-5, 5)$; son las soluciones de la inecuación: $|x| \leq 5$

corchetes, incluyen al nº!

8c) Todos los números reales cuya distancia al 3 es menor ó igual que 2



$S=[1,5]$, son las soluciones de la inecuación

2 para acá ← 🚶 → 2 para allá

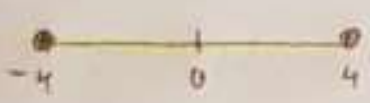
$|x-3| \leq 2$ ← cuánto camino

donde me paro

8d) $\{x \in \mathbb{R} \mid |x|=4\} = S$

$|x-0|=4$ ← camino 4 p'la derecha y p'la izq.

me paro en el cero

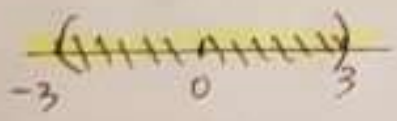


$S=\{-4,4\}$

sólo 2 nros están a distancia 4 del 0

8e) $\{x \in \mathbb{R} \mid |x|<3\}$

$|x|<3 \Leftrightarrow -3<x<3$



8f) $\{x \in \mathbb{R} / |x|=-2\}$; el módulo de x es un número positivo, siempre!

$\Rightarrow \nexists\, x \,/\, |x|=-2$; $S=\emptyset$

no existe

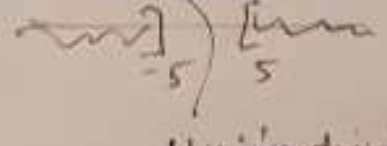
conjunto vacío.

8g) $\{x \in \mathbb{R} \mid |x| \geq 5$; $|x| \geq 5$ son los x que están a distancia ≥ 5 del 0

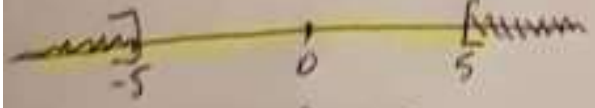
$|x-0| \geq 5$ ← camino 5 →

me paro en el 0

$|x| \geq 5 \Leftrightarrow x \geq 5$ ó $x \leq -5$



∪ unión de intervalos



5 ← 🚶 → 5

Cont Ej 8 - Práctica 1

8h) $\{x \in \mathbb{R} \,/\, |x| \geq -1\}$. Este ej. tiene trampa! Fíjense que cualquier sea x ($x \geq 0$ o $x \leq 0$) siempre su módulo será ≥ 0

$\Rightarrow$ seguro, cualquier $x \in \mathbb{R}$ tiene módulo ≥ -1

$\Rightarrow S = (-\infty, +\infty)$, es decir $S = \mathbb{R}$

8i) $\{x \in \mathbb{R} \,/\, |x| \leq -4\}$ En este caso, también hay trampa!

$|x| = -4$, $\nexists x$ y menos que de < -4 !

$\Rightarrow S = \phi$

Ejercicios Sueltos - Práctica 1

Ej. 1 _ Escribir como un intervalo o unión de intervalos el conjunto A

a) $A = \left\{x \in \mathbb{R} \,/\, \frac{x+1}{x} < \frac{2}{x}\right\}$; transformamos a algo del tipo $\frac{a}{b} < 0$

$$\Rightarrow \frac{x+1}{x} < \frac{2}{x} \Rightarrow \frac{x+1}{x} - \frac{2}{x} < 0 \Rightarrow \frac{x+1-2}{x} < 0 \Rightarrow \frac{x-1}{x} < 0$$

$\Rightarrow (x-1<0 \wedge x>0)$ ó $(x-1>0 \wedge x<0)$

$x<1 \wedge x>0$ ó $x>1 \wedge x<0$

$S_1 = (0,1)$ $\cup$ $S_2 = \phi$

$$S = S_1 \cup S_2 = (0,1) \cup \phi = (0,1)$$

Cont Ej. Sueltos - Práctica 1

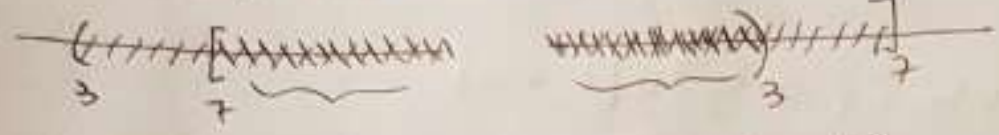
Ej 1 b) $A=\left\{x\in\mathbb{R} \,/\, \frac{1+x}{x-3}\leq 2\right\}$; transformamos la expresión a algo del tipo $\frac{a}{b}\leq 0$

$$\frac{1+x}{x-3}\leq 2 \Rightarrow \frac{1+x}{x-3}-2\leq 0 \Rightarrow \frac{(1+x)-2(x-3)}{(x-3)}\leq 0 \Rightarrow$$

$$\Rightarrow \frac{1+x-2x+6}{x-3}\leq 0 \Rightarrow \frac{-x+7}{x-3}\leq 0 \quad \left(\tfrac{a}{b}\leq 0\right) \Rightarrow$$

$$(-x+7\leq 0 \wedge x-3>0) \text{ ó } (-x+7\geq 0 \wedge x-3<0)$$

$$7\leq x \wedge x>3 \text{ ó } 7\geq x \wedge x<3$$



$$S_1=[7,+\infty) \quad \cup \quad S_2=(-\infty,3)$$

$$S=S_1\cup S_2=S_2\cup S_1=(-\infty,3)\cup[7,+\infty)$$

Ej 1 c) $A=\left\{x\in\mathbb{R} \,/\, \frac{x}{x+1}>1\right\} \Rightarrow \frac{x}{x+1}-1>0 \Rightarrow \frac{x-1(x+1)}{x+1}>0 \Rightarrow$

$\Rightarrow \frac{\cancel{x}-\cancel{x}-1}{x+1}>0 \Rightarrow \frac{-1}{x+1}>0 \Rightarrow$ como el numerador es negativo deberá ser el denominador negativo también

$$\Rightarrow x+1<0 \Rightarrow \boxed{x<-1}$$

$$S=(-\infty,-1)$$

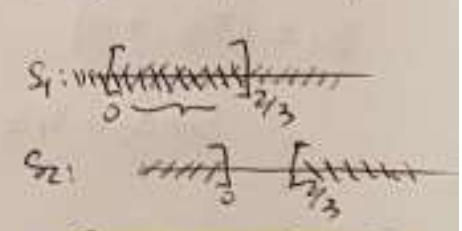
Ej 1d) $A=\left\{x\in\mathbb{R} \,/\, 2x\geq 3x^2\right\} \Rightarrow 2x-3x^2\geq 0 \Rightarrow \overbrace{x(2-3x)}^{a\,.\,b}\geq 0 \Rightarrow$

$a.b\geq 0 \Rightarrow (a\geq 0 \wedge b\geq 0) \text{ ó } (a\leq 0 \wedge b\leq 0)$

$(x\geq 0 \wedge 2-3x\geq 0) \text{ ó } (x\leq 0 \wedge 2-3x\leq 0)$

$x\geq 0 \wedge 2\geq 3x \text{ ó } x\leq 0 \wedge 2\leq 3x$

$x\geq 0 \wedge 2/3\geq x \text{ ó } x\leq 0 \wedge 2/3\leq x$;



$$S_1\cup S_2=[0,2/3]\cup\phi=[0,2/3]$$

Cont. Ej. Surtidos - Práctica 1

Ej 1e $A=\{x\in\mathbb{R} / (1-2x)(2-x)\geq 0\}$ es del tipo $a\cdot b\geq 0$ ($a\geq 0 \wedge b\geq 0$ ó $a\leq 0 \wedge b\leq 0$)

$\Rightarrow (1-2x\geq 0 \wedge 2-x\geq 0)$ ó $(1-2x\leq 0 \wedge 2-x\leq 0)$

$1\geq 2x \wedge 2\geq x$ ó $1\leq 2x \wedge 2\leq x$

$\frac{1}{2}\geq x \wedge 2\geq x$ ó $\frac{1}{2}\leq x \wedge 2\leq x$

$S_1=(-\infty, 1/2]$ $\cup$ $S_2=[2,+\infty)$

$S=S_1\cup S_2=(-\infty, 1/2]\cup[2,+\infty)$

1f) $A=\{x\in\mathbb{R} / \frac{6x^2}{2x-5}>3x\}$; transformamos:

$\frac{6x^2}{2x-5}>3x \Rightarrow \frac{6x^2}{2x-5}-3x>0 \Rightarrow \frac{6x^2-3x(2x-5)}{2x-5}>0 \Rightarrow \frac{\cancel{6x^2}-\cancel{6x^2}+15x}{2x-5}>0$

$\Rightarrow \frac{15x}{2x-5}>0$; del tipo $\frac{a}{b}>0 \Rightarrow$

$(15x>0 \wedge 2x-5>0)$ ó $(15x<0 \wedge 2x-5<0)$

$x>0/15 \wedge 2x>5$ ó $x<0/15 \wedge 2x<5$

$x>0 \wedge x>5/2$ ó $x<0 \wedge x<5/2$

$S_1=(5/2,+\infty)$ $\cup$ $S_2=(-\infty,0)$

$S=S_2\cup S_1=(-\infty,0)\cup(5/2,+\infty)$

Cont. Ejercicios Sorteos - Práctico 1

Ejercicio 2 ~ Hallar todos los $x<0$ que pertenecen al conjunto

$A = \{x \in \mathbb{R} / \frac{4}{x}+11<1\}$ (ojo! de todo lo que obtengamos, sólo tomar los $x<0$) (*)

transformamos $\frac{4}{x}+11<1 \Rightarrow$

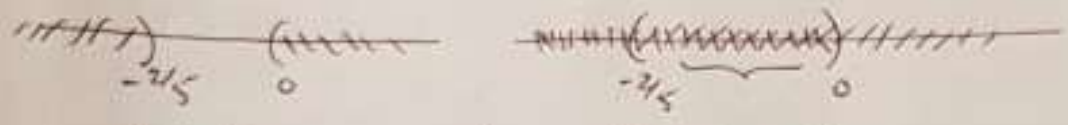
$\Rightarrow \frac{4}{x}+11-1<0 \Rightarrow \frac{4}{x}+10<0 \Rightarrow \frac{4+10x}{x}<0 \quad \left(\frac{a}{b}<0\right)$

$\Rightarrow (4+10x<0 \wedge x>0) \text{ ó } (4+10x>0 \wedge x<0)$

$10x<-4 \wedge x>0 \text{ ó } 10x>-4 \wedge x<0$

$x<-4/10 \wedge x>0 \text{ ó } x>-4/10 \wedge x<0$

$x<-2/5 \wedge x>0 \text{ ó } x>-2/5 \wedge x<0$



$S_1=\phi \quad \cup \quad S_2=(-2/5,0)$

(*)

$S = S_1 \cup S_2 = \phi \cup S_2 = (-2/5,0)$ y como son todos <0

$\Rightarrow A=(-2/5,0)=S$

dicendo