

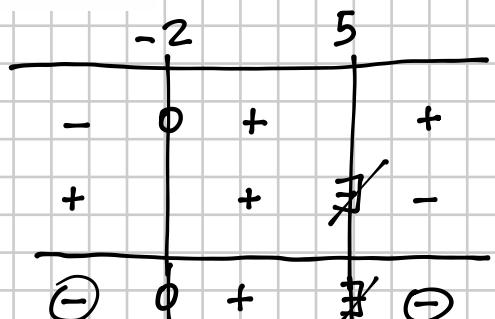
20 $\frac{5x + 10}{20 - 4x} < 0$

$[x < -2 \vee x > 5]$

$N > 0 \quad 5x + 10 > 0 \quad 5x > -10 \quad x > -2$

$D > 0 \quad 20 - 4x > 0 \quad -4x > -20 \quad x < 5$

\downarrow \uparrow
 $4x < 20$



$x < -2 \vee x > 5$

ESEMPIO

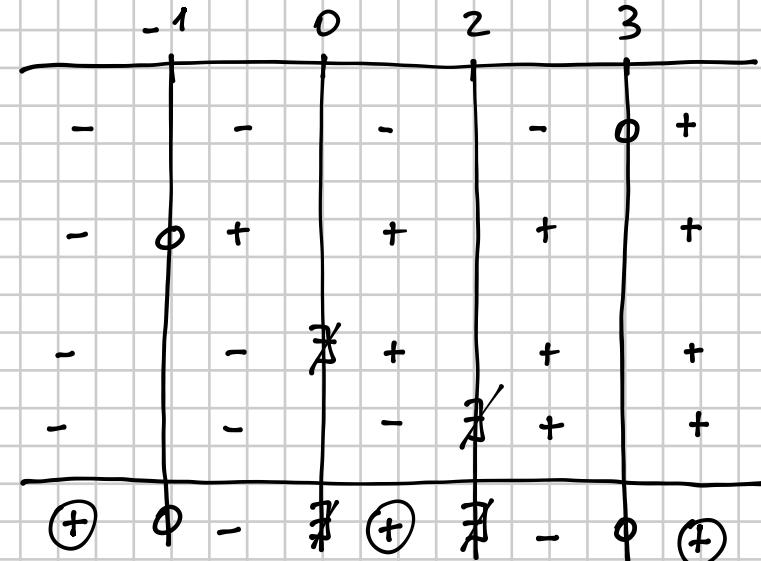
$$\frac{(x-3)(x+1)}{x(x-2)} \geq 0$$

$N_1 > 0 \quad x - 3 > 0 \quad x > 3$

$N_2 > 0 \quad x + 1 > 0 \quad x > -1$

$D_1 \quad x > 0$

$D_2 \quad x - 2 > 0 \quad x > 2$



$x \leq -1 \vee 0 < x < 2 \vee x \geq 3$

DISEQUAZIONI DI 2° GRADO

$$\begin{array}{ll}
 ax^2 + bx + c > 0 & ax^2 + bx + c \geq 0 \\
 ax^2 + bx + c < 0 & ax^2 + bx + c \leq 0
 \end{array} \quad \left| \Rightarrow ax^2 + bx + c \stackrel{?}{\geq} 0$$

1^a COSA DA FARE \Rightarrow a deve essere > 0 ; se non lo è, cambio i segni e inverso la diseguaglianza

ES.

$$-5x^2 + 3x - 1 > 0 \Rightarrow 5x^2 - 3x + 1 < 0$$

$$-\frac{3}{2}x^2 + \frac{7}{5}x + \frac{14}{31} \leq 0 \Rightarrow \frac{3}{2}x^2 - \frac{7}{5}x - \frac{14}{31} \geq 0$$

Ci sono 3 casi: $\Delta > 0$, $\Delta = 0$, $\Delta < 0$

2^a COSA DA FARE \Rightarrow controllare il Δ

1) $\Delta > 0$: il polinomio ammette 2 radici reali distinte x_1, x_2

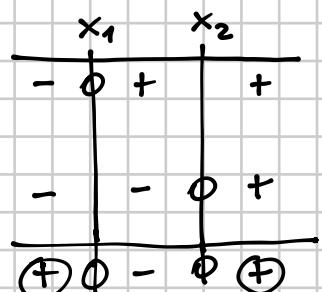
$$ax^2 + bx + c = a(x - x_1)(x - x_2) \quad (x_1 < x_2)$$

$$\text{se ho } \underset{\substack{\uparrow \\ a > 0}}{a}(x - x_1)(x - x_2) > 0 \iff \underset{\substack{\uparrow \\ N_1 \\ N_2}}{(x - x_1)(x - x_2)} > 0$$

quindi
non influisce
nel segno
del polinomio

$$N_1 > 0 \quad x - x_1 > 0 \quad x > x_1$$

$$N_2 > 0 \quad x - x_2 > 0 \quad x > x_2$$



Se fasse $ax^2 + bx + c < 0 \downarrow$

$$x_1 < x < x_2$$

$$x < x_1 \vee x > x_2$$

In pratica: $\Delta > 0$ e $a > 0$ (x_1 e x_2 radici con $x_1 < x_2$)

$$ax^2 + bx + c > 0$$

$$x < x_1 \vee x > x_2$$

(INTERVALLI ESTERNI
ALLE RADICI)

$$ax^2 + bx + c < 0$$

$$x_1 < x < x_2$$

(INTERVALLO INTERNO
O COMPRESCO TRA
LE RADICI)

$$ax^2 + bx + c \geq 0$$

$$x \leq x_1 \vee x \geq x_2$$

$$ax^2 + bx + c \leq 0$$

$$x_1 \leq x \leq x_2$$

ESEMPI

1) $3x^2 + 5x - 1 \geq 0$

$$\Delta = 25 + 12 = 37$$

$$x_{1,2} = \frac{-5 \pm \sqrt{37}}{6}$$

$$x_1 = \frac{-5 - \sqrt{37}}{6}$$

$$x_2 = \frac{-5 + \sqrt{37}}{6}$$

$x \leq \frac{-5 - \sqrt{37}}{6} \quad \vee \quad x \geq \frac{-5 + \sqrt{37}}{6}$

2) $-2x^2 + 3x + 1 > 0 \Rightarrow 2x^2 - 3x - 1 < 0$

CAMBIO
SEGNI

$$\Delta = 9 + 8 = 17$$

$$x_{1,2} = \frac{3 \pm \sqrt{17}}{4} = \begin{cases} \frac{3 - \sqrt{17}}{4} \\ \frac{3 + \sqrt{17}}{4} \end{cases}$$

$$\frac{3 - \sqrt{17}}{4} < x < \frac{3 + \sqrt{17}}{4}$$

122 $x^2 - 3 \geq 0$

$[x \leq -\sqrt{3} \vee x \geq \sqrt{3}]$

$a > 0 \quad \Delta = +12 > 0$

Per trovare le radici del polinomio
 $x^2 - 3$ devo risolvere $x^2 - 3 = 0$

$x^2 = 3$

$x = \pm \sqrt{3}$

↓

$x_1 = -\sqrt{3}$

$x_2 = \sqrt{3}$

$x \leq -\sqrt{3} \quad \vee \quad x \geq \sqrt{3}$

127 $-x^2 + x + 20 > 0$

$[-4 < x < 5]$

$x^2 - x - 20 < 0$

$\Delta = 1 + 80 = 81$

$$x_{1,2} = \frac{1 \pm 9}{2} = \begin{cases} -4 \\ 5 \end{cases}$$

$-4 < x < 5$

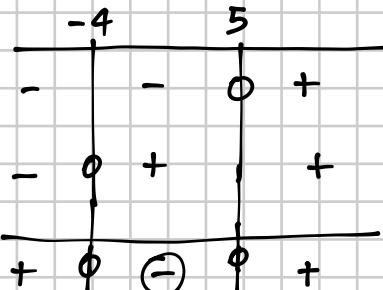
Questo si potere anche risolvere col metodo "recursivo" della scomposizione:

$$x^2 - x - 20 < 0$$

$$(x-5)(x+4) < 0$$

$x-5 > 0 \quad x > 5$

$x+4 > 0 \quad x > -4$



$-4 < x < 5$