Semplificazione verifica

es. da 354 a 380 %1=00

es 354   OK $x^0 - 8 \leq 0$

$\sqrt{3}(2-x)^3 > 0$ $-\sqrt[3]{8} \leq x \leq \sqrt[3]{8}$

$x - 2 < 0$ $-\sqrt{2} \leq x \leq \sqrt{2}$

$x < 2 \quad S.\ ]2;+\infty[$ $[\sqrt{2};\sqrt{2}]$

es 358   OK   es 360

$\frac{1}{3} x^9 \geq 0 \quad \forall x \in \mathbb{R}$ $(x^2-4)^3 < 0$

$]+-\infty;+\infty[$ $x^2 - 4 < 0 \quad S\{-2 < x < 2\}\ ]-2;2[$

es 362   OK   es 364

$(\sqrt{3}-1)x^{11} \leq 0$ $2x^8 + x^4 - 3 > 0$

                         $2x^8 + x^4 - 3 = 0$

$x\sqrt{3x} - x^{11} \leq 0$ $t = x^4$

$x \leq 0$ $2t^2 + t - 3 = 0$

$\mathbb{I}\ ]-\infty;0]$ $t_{1,2} = \frac{-1 \pm \sqrt{1+24}}{4} = \begin{cases} 1 \\ -\frac{3}{2} \end{cases}$

                         $t < 1 \lor t > \frac{3}{2}$

                         $x^4 < 1 \lor x^4 > \frac{3}{2}$

                         $-1 < x < 1 \qquad x^4 > \frac{3}{2} \qquad x^8 = \frac{\sqrt[4]{3}}{\sqrt[4]{2}}$

es 366   bk
$(2x+3)(x-4)^4 < 0$

$2x+3 > 0$
$x > -\dfrac{3}{2}$

$(x-4)^4 \geq 0 \quad \forall x \in \mathbb{R}$

S: ...   S: $x < -\dfrac{3}{2}$

S: $]-\infty, -\dfrac{3}{2}[$ U: $]-\infty, -\dfrac{3}{2}[$

es 368
$-2(x^2+4)(x^2-25) > 0$

$(-2x^2-8)(x^2-25) > 0$

$\forall x \in \mathbb{R} \quad S: -5 < x < 5 \qquad S:]-5, 5[$

es 370   (NO)
$-4(2x+1)^3(1-x)^5 \geq 0$

$-8 x^3$

$2x+1 \geq 0 \qquad 1-x \geq 0$
$x \geq -\dfrac{1}{2} \qquad x \leq 1 \qquad S: \{x \geq -\dfrac{1}{2} \ v \ x \geq 1\}$

$S:]-\infty; -\dfrac{1}{2}] \cup [1; +\infty[$

es 372

$-x^4+3x^3-x+3 \leq 0$

$-x(x^3+1)+3(x^3+1) \leq 0$

$(x^3+1)(-x+3) \leq 0$

$x \leq -1 \ V \ x \geq 3$

$]-\infty; -1] \cup [3; +\infty[$

es 378

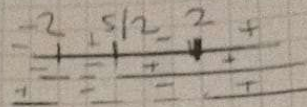$2x^5 - 5x^2 + 8x - 20 < 0$

$2x(x^2 + 4) - 5(x^2 + 4) < 0$

$(2x - 5)(x^2 + 4) < 0$

$2x - 5 > 0$	$x^2 + 4 > 0$
$x > \frac{5}{2}$	$x < -2 \lor x > 2$

$x < -2 \lor \frac{5}{2} < x < 2$

$S:]-\infty, -2[\cup]\frac{5}{2}; 2[$

es 380   NO

$2x(x^2 + 1) + x^3(x - 1) - (3x + 1) > 0$

$2x(x^2 + 1) + x^3(x - 1) + (-3x + 1) > 0$

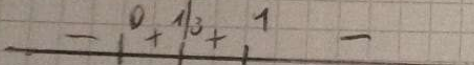| $2x > 0$	$x^3 > 0$	$-3x + 1 > 0$
$x > 0$	$x > 0$	$x < \frac{1}{3}$
$x^2 + 1 > 0$	$x - 1 > 0$	
$\forall x \in \mathbb{R}$	$x > 1$	

S:

ES 374

$(x^2-3)^2 < 4x^2$

$-4x^2 + (x^2-3)^2 < 0$

$-4x^2 + x^4 - 6x^2 + 9 < 0$

$x^4 - 10x^2 + 9 < 0$

$x^2 = t$

$t^2 - 10t + 9 < 0$

$t_{1,2} = 5 \pm \sqrt{25-9} = \begin{cases} 9 \\ 1 \end{cases}$

$1 < t < 9$

$1 < x^2 < 9$

$\begin{cases} x^2 > 1 \\ x^2 < 9 \end{cases}$

$x < -1 \lor x > 1$

$-3 < x < 3$

S: $]-3, -1[\cup]1, 3[$

$-3 < x < -1 \lor 1 < x < 3$

es 376   NO

$8x^4 + 2x^2 \le 0$

$4x^4 + x^2 \le 0$

$\to$ MINORE NON
PUO MAI ESSERE
UGUALE   SOLO SE $x = 0$

$x^2 (4x^2 + 1) \le 0$

$x^2 \ge 0 \Rightarrow x \ge 0$

$4x^2 + 1 \ge 0 \quad \forall x \in \mathbb{R}$

$\forall x \in \mathbb{R}$

$-$ 0 $+$

S: $\{0\}$

es 382

$4x^3(x^3-64)(x+1)^2 \geq 0$

$4x^3 \geq 0 \qquad\qquad x \geq 0$

$x^3 - 64 \geq 0 \qquad\qquad x \geq 4$

$(x+1)^2 \geq 0 \qquad \forall x \in \mathbb{R}$
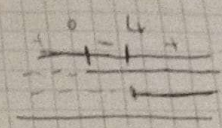
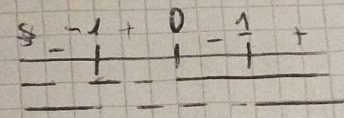$S: x \leq 0 \vee x \geq 4 \qquad S:]-\infty, 0] \cup [4, +\infty[$

es 384

$x^5 + \frac{1}{2}x(3x^3-1) - \frac{1}{2}x(x^3+1) > x^4$

$x^5 + \frac{3}{2}x^4 - \frac{1}{2}x - \frac{1}{2}x^4 - \frac{1}{2}x - x^4 > 0$

$x^5 - x > 0$
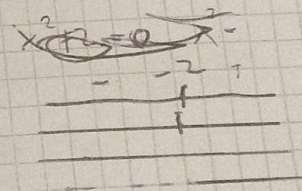
$x(x^4-1) > 0$

$x > 0$

$x^4 > 1$

$-1 < x < 1$

$S: -1 < x < 0 \vee x > 1$

$S:]-1; 0[\cup]1; +\infty[$

es 386

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

$(x^2+2)^2 \geq 0 \qquad \forall x \in \mathbb{R}$

$0 < x^2+6-2x > 0$

$2x^2 - x + 3 \geq 0 \qquad \forall x \in \mathbb{R}$

$x_{1,2} = 1 \pm \sqrt{1-4\cdot 3} \quad IMP$

$2x+4 \geq 0$

$x \geq -2$

es 388

$$x^2(x^2+1) + 7x(x+1) - 7(x-2) < 2$$

$$x^4 + x^2 + 7x^2 + 7x - 7x + 14 - 2 < 0$$

$$x^4 + 8x^2 + 12 < 0$$

$x^2 = t$

$$t^2 + 8t + 12 < 0$$

$t_{1,2} = -6, -2 \qquad -6 < x^2 < -2$

$$\begin{cases} x^2 > -6 & \forall x \in \mathbb{R} \\ x^2 > -2 & \forall x \in \mathbb{R} \end{cases} \qquad\qquad = \quad \text{S: } \forall x \in \mathbb{R}$$

es 390

$$ax^2 - (a+3)x - a^2 = 0 \implies x \notin \mathbb{R} \text{ IMPOSSIBILE}$$

$$-(a+3)^2 + 4a^3 < 0 \qquad ax^2 + (-a-3)x - a^2$$

$$-a^3 + 4a^3 - 6a + 9 < 0 \qquad \Delta < 0$$

$$3a^3 + 6a + 9 < 0$$

$$(-a-3)^2 + 4a^3 < 0$$

$$\frac{3}{?}(a^3 + 2a + 3) < 0$$

$$a^2 + 9 + 6a + 4a^3 < 0$$

$$(4a^3 + a^2 + 6a + 9) < 0$$

$$a(\cancel{a^2 + 6a}) + 3(a+3) < 0$$

$$4a^3 + a^2 + 6a + 9 \qquad \pm 3 \pm 9 \pm 1$$

$$P(1) \neq 0$$

$$P(1) = 4 + 1 - 6 + 9 \neq 0$$

$$\begin{array}{c|ccc|c} & 4 & 1 & 6 & 9 \\ \hline -1 & & -4 & +3 & 9 \\ \hline & 4 & -3 & 9 & 0 \end{array}$$

$$(4a^2 - 3a + 9)(a+1) < 0$$

$a > -1$

$4a^2 - 3a + 9 > 0$

$\Rightarrow x_{1,2} = \dfrac{3 \pm \sqrt{9}}{...} \to \text{imp} \quad \forall x \in \mathbb{R}$

$S: a < -1$

$$\begin{array}{ccc} - & -1 & + \\ \hline - & | & + \end{array}$$

es 631

$$\dfrac{3x^3 + 9x^2}{x^2 + 5x} > 0$$

N^o $3x^3 + 9x^2 > 0$

$3x^2(x+3) > 0$

$3x^2 > 0 \qquad x > -3$

$\forall x \in \mathbb{R}$

$$\begin{array}{ccccccc} - & * & -5 & + & -3 & - & 0 & + \end{array}$$

$S: -5 < x < 3 \lor x > 0$

$S: \,]-5;3[\,\cup\,]0;+\infty[$

$D \qquad x^2 + 5x > 0$

$x(x+5) > 0$

$x > 0 \quad x > -5$

es 433

$$\dfrac{x^3 - 12x - x^2}{2x^2 + 6} > 0$$

$N \qquad x(x^2 - x - 12) > 0$

$x > 0 \qquad x < -3 \lor x > 4$

$$\begin{array}{ccccccc} - & -3 & + & 0 & - & 4 & + \end{array}$$

$D \qquad 2x^2 + 6 > 0$

$\forall x \in \mathbb{R}$

$-3 < x < 0 \lor x > 4$

$]-3;0[\,\cup\,]4;+\infty[$

es 435

$$\frac{x^3 - 4x^2 - x + 4}{x^4 + 3x^2 - 4} \geq 0$$
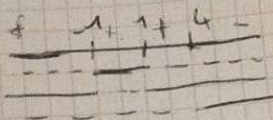
$N > 0 \quad x(x^2 - 1) + 4(x^2 - 1) \geq 0$

$$(x - 4)(x^2 - 1) \geq 0$$

$x \geq 4 \qquad -1 \leq x \leq 1$

$D > 0$

$x^4 + 3x^2 - 4 > 0$

$t = x^2 \quad t^2 + 3t - 4 > 0$

$x^2 = -4 \lor x^2 > 1$

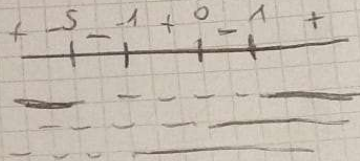$ \quad \exists \in \mathbb{R} \quad x < -1 \lor x > 1$

es 463

$$\frac{x+2}{2x+2} + \frac{x-2}{x^2+x} \geq \frac{1}{2x^2+2x}$$

$$\frac{3x^2 + 2x + 2x - 4}{2x^2 + 2x} \geq \frac{1}{2x^2+2x}$$

$$\frac{3x^2 + 4x - 5}{2x^2 + 2x} \geq 0$$

$N \geq 0 \quad 2x^2 + 8x - 3 \geq 0$

$x_{1/2} = \frac{-4 \pm \sqrt{16 + 18}}{2}$

$x_{1/2} = x \leq -5 \lor x \geq 1$

$D \quad 2x^2 + 2x > 0$

$2x(x+1) > 0$

$x > 0 \quad x > -1$

$S: x \leq -5 \lor -1 < x < 0 \lor x > 1$

$S:]-\infty; -5] \cup]-1; 0[\cup [1; +\infty[$

es 467

$$\frac{x^2-1}{2x^2-4x} + \frac{2}{3x} > \frac{x}{x-2}$$

es 469

$$\frac{x}{x+1} - \frac{3}{x+2} > \frac{x}{x^2+3x+2}$$

$6x \cdot 12(x^2-4x)$

es 492

$$\begin{cases} 9x^2 - 12x + 4 > 0 \\ 4x + 1 \geq 0 \end{cases}$$

$(3x-2)^2 > 0 \qquad \forall x \in \mathbb{R}, x \neq \frac{2}{3}$

$3x - 2 \neq 0$

$x \neq \frac{2}{3}$

$4x + 1 \geq 0$

$x \geq -\frac{1}{4}$

$-\frac{1}{4} \quad 2/3$

$S: x \geq \frac{1}{4}, x \neq \frac{2}{3} \rightarrow$ SECONDO

$S: \left[\frac{1}{4}; \frac{2}{3}\right[\cup \left]\frac{2}{3}; +\infty\right[$

es 512

$$\begin{cases} x^4 - 4x^3 \geq 0 \\ x^2 - 7x + 10 < 0 \end{cases}$$

1°: $x^3(x-4) \geq 0$

$x \geq 0$

$x \geq 4 \qquad x \leq 0 \lor x \geq 4$

$\div \quad 0 \quad \div \quad 4 \quad +$

II: $x^2 - 7x + 10 < 0$

$2 < x < 5$

$0 \quad 2 \quad 4 \quad 5$

$S: x \geq 4 \; 4 \leq x < 5$

$S: [4; 5[$

es 530

$$\begin{cases} x^2 + x - 6 \geq 0 \\ -\dfrac{x}{4x-1} < 0 \end{cases}$$

$x^2 + x - 6 \geq 0$

$1^\circ \quad x \leq -3 \lor x \geq 2$

$2^\circ \quad \dfrac{-x}{4x-1} < 0$

$N > 0$

$-x > 0$

$x < 0$

$4x - 1 \gtrless 0$

$x \gtrless \dfrac{1}{4}$

STUDIO

$\qquad S_2 = 0 < x < \dfrac{1}{4}$

$x < 0 \lor x > \dfrac{1}{4}$

$S: \quad x \leq -3 \lor x \geq 2$

$S: \quad]-\infty; -3] \cup [2; +\infty[$

es 532

$$\begin{cases} x^4 - 4x^2 + 4 > 0 \\ \dfrac{1}{x^2} \geq 0 \end{cases}$$

$1^\circ \quad x^2 = t$

$t^2 - 4t + 4 > 0$

$t_{1,2} = 2 \pm \sqrt{4-4} = 2 \qquad \forall t \in \mathbb{R}, t \neq 2$

$x^2 = \begin{cases} 2 \end{cases} \qquad S: \quad x \neq \pm\sqrt{2}$

$2^\circ \quad \dfrac{1}{x^2} \geq 0$

$N \geq 0 \quad \forall x \in \mathbb{R}$

$x^2 > 0 \quad \forall x \in \mathbb{R}, x \neq 0$

$S: \quad \forall x \in \mathbb{R}, x \neq \pm\sqrt{2}, x \neq 0$

es 5 18
$h = 2b + 3 = +$
$B = 3b + 1$
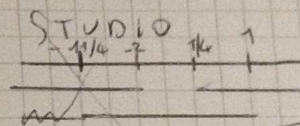$A < 12,5 \lor A > 3,5 \qquad b \in \mathbb{R}^+$

$$\begin{cases} \dfrac{(b + 3b + 1) \cdot (2b + 3)}{2} > 3,5 \\[4mm] \dfrac{(b + 3b + 1)(2b + 3)}{2} < 12,5 \end{cases}$$

CALCOLO AREA COMESE FOSSE A PARTE

$$\frac{2b^2 + 3b + 6b^2 + 9b + 2b + 3}{2}$$

STUDIO
$-11/4 \quad -7 \quad 1/4 \quad 1$

$$\frac{8b^2 + 14b + 3}{2}$$

$S: \quad \dfrac{1}{4} < b < 1$

1°T $\quad 4b^2 + 7b + 1,5 > 3,5$

$4b^2 + 7b - 2 > 0$

$b_{1,2} = \dfrac{-7 \pm \sqrt{49 + 32}}{8} \quad < \begin{array}{c} -2 \\ \frac{1}{4} \end{array}$

$X < -2 \lor X > \dfrac{1}{4}$

2°T $\quad 4b^2 + 7b + 1,5 < 12,5$

$4b^2 + 7b - 11 < 0$

$b_{1,2} = \dfrac{-7 \pm \sqrt{49 + 176}}{8} = \dfrac{-7 \pm 15}{8} \quad < \begin{array}{c} -\frac{11}{4} \\ 1 \end{array} \qquad -\dfrac{11}{4} < x < 1$

es 523

x = n. della ~~∈ N~~   n alunni ∈ N   n°n Maschi

≤ 35 $\frac{1}{4} n^2 + n \le 35$

$\frac{1}{4} n^2 + n - 35 \le 0$

$n_{1,2} = \dfrac{-1 \pm \sqrt{1+35}}{1/2} = 2 \cdot (-1 \pm 6) \stackrel{n'maschi}{=} 10 \to$ esclude neg.

$35 - 10 = 25 \to$ n femm.

$S = \{ 25 ; 10 \}$