1. $\frac{(x+1)^2}{4} - \frac{x-4}{12} = \frac{5x(x+1)}{36} + \frac{(x+2)^2}{9}$

$9\,(x+1)^2 - 3\,(x-4) = 5x\,(x+1) + 4\,(x+2)^2$ $\quad 9\,(x^2+2x+1) - 3x + 12 = 5x^2 + 5x + 4\,(x^2+4x+4)$

$9x^2 + 18x + 9 - 3x + 12 = 5x^2 + 5x + 4x^2 + 16x + 16$

$15x - 21x = -21 + 16$ $\quad -6x = -5$ $\quad \boldsymbol{x = \frac{5}{6}}$

2. $x(x+1) - 2(x+4)(x-3) + 2x = (2-x)(x+1)$

$x^2 + x - 2\,(x^2 - 3x + 4x - 12) + 2x = 2x + 2 - x^2 - x$ $\quad x^2 + x - 2x^2 + 6x - 8x + 24 = 2 - x^2 - x$

$-x + x = -24 + 2$ $\quad 0x = -22$ $\quad \boldsymbol{\nexists x \in \mathbb{R}}$

3. $\frac{1}{x^2+2x-3} + \frac{1}{(x-2)(x+3)} = \frac{1}{x^2-3x+2}$

$\frac{1}{(x+3)(x-1)} + \frac{1}{(x-2)(x+3)} = \frac{1}{(x-2)(x-1)}$ $\quad \frac{x-2+x-1}{(x+3)(x-1)(x-2)} = x+3$ $\quad C.A.: \quad x \neq -3 \wedge x \neq 1 \wedge x \neq 2$

$\boldsymbol{x = 6}$ $\quad acc.$

4. $1 + \frac{x+1}{x-2} = \frac{2(x^2+2)}{x^2-4}$

$1 + \frac{x+1}{x-2} = \frac{2x^2+4}{(x-2)(x+2)}$ $\quad \frac{x^2-4+(x+1)(x+2)}{(x-2)(x+2)} = 2x^2+4$ $\quad C.A.: \quad x \neq \pm 2$

$x^2 - 4 + x^2 + 2x + x + 2 = 2x^2 + 4$ $\quad 3x = 6$ $\quad x = 2$ $\quad non\ accettabile\ per\ C.A. \Rightarrow \boldsymbol{\nexists x \in \mathbb{R}}$

5. $\left(\frac{x+1}{x-1} - \frac{x-1}{x+1}\right) : \left(\frac{x-1}{x+1} + \frac{x+1}{x-1}\right) = \frac{2x}{x^2+1}$

$\frac{(x+1)^2 - (x-1)^2}{(x-1)(x+1)} : \frac{(x-1)^2 + (x+1)^2}{(x+1)(x-1)} = \frac{2x}{x^2+1}$

$\frac{x^2+2x+1-x^2+2x-1}{(x-1)(x+1)} : \frac{x^2-2x+1+x^2+2x+1}{(x-1)(x+1)} = \frac{2x}{x^2+1}$ $\quad C.A.: \quad x \neq \pm 1$

$\frac{4x}{(x-1)(x+1)} \cdot \frac{(x-1)(x+1)}{2x^2+2} = \frac{2x}{x^2+1}$ $\quad \frac{4x}{2(x^2+1)} = \frac{2x}{x^2+1}$

$\frac{2x}{x^2+1} = \frac{2x}{x^2+1}$ $\quad 0 = 0$ $\quad \boldsymbol{\forall x \in \mathbb{R} - \{\pm 1\}}$

6. $\frac{4}{x+1} = \frac{2}{x}$

$\frac{4x = 2(x+1)}{x(x+1)}$ $C.A.: \quad x \neq -1 \wedge x \neq 0$ $4x = 2x + 2$ $2x = 2$ $\boldsymbol{x = 1}$ $acc.$

7. $ax - a = a^2$

$ax = a + a^2$ $ax = a\,(1 + a)$

$Se\ a = 0$: $\forall \boldsymbol{x} \in \mathbb{R}$ $Se\ a \neq 0$: $\boldsymbol{x = a + 1}$

8. $3x(a+1) + 3(a+1) - 2(x+1) = -(3a-1)(3a+1)$

$3ax + 3x + 3a + 3 - 2x - 2 = -(9a^2 - 1)$ $3ax + x = -3a - 1 - 9a^2 + 1$

$x\,(3a+1) = -3a\,(1 + 3a)$

$Se\ a = -\frac{1}{3}$: $\forall \boldsymbol{x} \in \mathbb{R}$ $Se\ a \neq -\frac{1}{3}$: $\boldsymbol{x = -3a}$

9. $\frac{3x+a}{a^2-4} + \frac{6x}{a-2} = \frac{5x}{a+2}$

$\frac{3x + a}{(a-2)(a+2)} + \frac{6x}{a-2} = \frac{5x}{a+2}$ $C.E.: \quad a \neq \pm 2$

$3x + a + 6x\,(a+2) = 5x\,(a-2)$ $3x + a + 6ax + 12x = 5ax - 10x$

$25\,x + ax = -a$ $x\,(a + 25) = -a$

$Se\ a = -25$: $\nexists \boldsymbol{x} \in \mathbb{R}$ $Se\ a = \pm 2$: $\boldsymbol{l'equazione\ perde\ significato}$

$Se\ a \neq -25 \wedge a \neq \pm 2$: $\boldsymbol{x = -\frac{a}{a + 25}}$