Equations, inéquations et systèmes : Solutions

1. Résoudre dans $\mathbb{R}$:

   (a) $3x - 6(3 - 4x) = 9x - 2$

$\Leftrightarrow 3x - 18 + 24x = 9x - 2$

$\Leftrightarrow 27x - 9x = -2 + 18$

$\Leftrightarrow 18x = 16$

$\Leftrightarrow x = \frac{16}{18}$

$\Leftrightarrow x = \frac{8}{9}$ $\quad S : \left\{ \frac{8}{9} \right\}$

   (b) $3x - 2x(x - 1) = -2x^2 + 7x - 12$

$\Leftrightarrow 3x - 2x^2 + 2x = -2x^2 + 7x - 12$

$\Leftrightarrow 5x - 7x = -12$

$\Leftrightarrow -2x = -12$

$\Leftrightarrow x = 6$ $\quad S : \{ 6 \}$

(c) $\frac{2x-3}{7} = \frac{3x}{7} - 2x$

$\Leftrightarrow \quad \frac{2x-3}{7} = \frac{3x-14x}{7}$

$\Leftrightarrow \quad 2x + 11x = 3$

$\Leftrightarrow \quad 13x = 3$

$\Leftrightarrow \quad x = \frac{3}{13}$ $\qquad S: \left\{\frac{3}{13}\right\}$

(d) $\frac{2}{3}(x-4) = \frac{5}{4} - 7x$

$\Leftrightarrow \quad \frac{8x-32}{12} = \frac{15-84x}{12}$

$\Leftrightarrow \quad 8x + 84x = 15 + 32$

$\Leftrightarrow \quad 92x = 47$

$\Leftrightarrow \quad x = \frac{47}{92}$ $\qquad S: \left\{\frac{47}{92}\right\}$

(e) $3(21+7x)-57=-21x+75$

$\Leftrightarrow 63+21x-57=-21x+75$

$\Leftrightarrow 21x+21x=75-6$

$\Leftrightarrow 42x=69$

$\Leftrightarrow x=\frac{69}{42}$

$\Leftrightarrow x=\frac{23}{14}$ $\quad S=\left\{\frac{23}{14}\right\}$

(f) $2(-12+15x)=3(10x-8)$

$\Leftrightarrow -24+30x=30x-24$

$\Leftrightarrow 0x=0$ $\quad S=\mathbb{R}$

(g) $(7x+5)^2-(x-3)^2=27$

$\Leftrightarrow x^2+10x+25-(x^2-6x+9)=27$

$\Leftrightarrow x^2+10x+25-x^2+6x-9=27$

$\Leftrightarrow 16x=27-16$

$\Leftrightarrow 16x=11$

$\Leftrightarrow x=\frac{11}{16}$

$S:\left\{\frac{11}{16}\right\}$

(h) $(4x-1)(4x+1)=2x(1+4x)+(x+1)(8x+3)$

$\Leftrightarrow 16x^2-1=2x+8x^2+8x^2+11x+3$

$\Leftrightarrow -1-3=13x$

$\Leftrightarrow -4=13x$

$\Leftrightarrow x=-\frac{4}{13}$

$S:\left\{-\frac{4}{13}\right\}$

(i) $(2-5?x)(5x?-2)+(1-5x?)^2 = x?-3(1-4x?)$

$\Leftrightarrow -(25x^2-20x+4)+(1-10x+25x^2) = x-3+12x$

$\Leftrightarrow -25x^2+20x-4+1-10x+25x^2 = 13x-3$

$\Leftrightarrow 10x-13x = -3+3$

$\Leftrightarrow -3x = 0$

$\Leftrightarrow x = 0$ $\quad L: \{0\}$

(j) $(?x-4)^2-5(16-x?) = x(?x-3)$

$\Leftrightarrow x^2-8x+16-80+5x = x^2-3x$

$\Leftrightarrow -3x+3x = 64$

$\Leftrightarrow 0x = 64$ $\quad L: \emptyset$

(k) $\left(\frac{1}{2}x+3\right)^2 = \frac{x^2}{4} - \frac{1}{3}x + 2$

$\Leftrightarrow \frac{1}{4}x^2 + 3x + 9 = \frac{x^2}{4} - \frac{1}{3}x + 2$

$\Leftrightarrow 3x + \frac{1}{3}x = -7$

$\Leftrightarrow \frac{10x}{3} = -7$

$\Leftrightarrow x = -\frac{21}{10}$ $\quad L: \left\{-\frac{21}{10}\right\}$

(l) $\frac{(x-1)^2}{2} + \frac{(x+2)(x-3)}{5} = \frac{7(x+1)(x-3)}{10}$

$\Leftrightarrow \frac{5(x^2-2x+1)+2(x^2-x-6)}{10} = \frac{7(x^2-2x-3)}{10}$

$\Leftrightarrow 5x^2 - 10x + 5 + 2x^2 - 2x - 12 = 7x^2 - 14x - 21$

$\Leftrightarrow -12x + 14x = -21 + 7$

$\Leftrightarrow 2x = -14$

$\Leftrightarrow x = -7$ $\quad L: \{-7\}$

(m) $\left(x-\frac{1}{2}\right)\left(x+\frac{1}{2}\right)-x(x+1)=3\left(x-\frac{1}{4}\right)$

$\Leftrightarrow x^2 - \frac{1}{4} - x^2 - x = 3x - \frac{3}{4}$

$\Leftrightarrow -x - 3x = -\frac{3}{4} + \frac{1}{4}$

$\Leftrightarrow -4x = -\frac{1}{2}$

$\Leftrightarrow x = \frac{1}{8}$ $\quad S: \left\{\frac{1}{8}\right\}$

(n) $5-\frac{2x+1}{2}=\frac{-3x+7}{3}$

$\Leftrightarrow \frac{30-3(2x+1)}{6} = \frac{2(-3x+7)}{6}$

$\Leftrightarrow 30 - 6x - 3 = -6x + 14$

$\Leftrightarrow 27 = 14$ $\quad S: \{\}$

2. Résoudre dans $\mathbb{R}$:

(a) $x(x+7)=0$

$$\begin{cases} x=0 \\ x+7=0 \end{cases} \iff \begin{cases} x=0 \\ x=-7 \end{cases}$$

$$S : \{-7, 0\}$$

(b) $3x(x-1)(x+3)=0$

$$\begin{cases} 3x=0 \\ x-1=0 \\ x+3=0 \end{cases} \iff \begin{cases} x=0 \\ x=1 \\ x=-3 \end{cases} \qquad S : \{-3, 0, 1\}$$

(c) $3=x^2$

$$\iff x^2-3=0 \iff (x-\sqrt{3})(x+\sqrt{3})=0$$

$$\iff \begin{cases} x-\sqrt{3}=0 \\ x+\sqrt{3}=0 \end{cases} \iff \begin{cases} x=\sqrt{3} \\ x=-\sqrt{3} \end{cases}$$

$$S : \{-\sqrt{3}, \sqrt{3}\}$$

(d) $x^3 = x$

$\Leftrightarrow x^3 - x = 0 \quad \Leftrightarrow x(x^2 - 1) = 0 \quad \Leftrightarrow x(x-1)(x+1) = 0$

$\Leftrightarrow \begin{cases} x = 0 \\ x - 1 = 0 \\ x + 1 = 0 \end{cases} \quad \Leftrightarrow \begin{cases} x = 0 \\ x = 1 \\ x = -1 \end{cases}$

$L: \{-1, 0, 1\}$

(e) $2x^2 - 32 = 0$

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

$\Leftrightarrow \begin{cases} x - 4 = 0 \\ x + 4 = 0 \end{cases} \quad \Leftrightarrow \begin{cases} x = 4 \\ x = -4 \end{cases}$

$L: \{-4, 4\}$

(f) $x^4 - 81 = 0$

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

$\Leftrightarrow \begin{cases} x - 3 = 0 \\ x + 3 = 0 \\ x^2 + 9 = 0 \quad \text{imp} \end{cases} \Leftrightarrow \begin{cases} x = 3 \\ x = -3 \end{cases}$

$S : \{-3, 3\}$

(g) $25x^2 - 10x = -1$

$\Leftrightarrow 25x^2 - 10x + 1 = 0 \Leftrightarrow (5x - 1)^2 = 0$

$\Leftrightarrow 5x - 1 = 0 \Leftrightarrow x = \frac{1}{5}$

$S : \{\frac{1}{5}\}$

(h) $12x - 18 = 2x^2$

$\Leftrightarrow 2x^2 - 12x + 18 = 0 \Leftrightarrow 2(x^2 - 6x + 9) = 0$

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

$S: \{3\}$

(i) $27x^3 = 18x^2 - 3x$

$\Leftrightarrow 27x^3 - 18x^2 + 3x = 0 \Leftrightarrow 3x(9x^2 - 6x + 1) = 0$

$\Leftrightarrow 3x(3x-1)^2 = 0$

$\Leftrightarrow \begin{cases} 3x = 0 \\ (3x-1)^2 = 0 \end{cases} \Leftrightarrow \begin{cases} x = 0 \\ 3x - 1 = 0 \end{cases} \Leftrightarrow \begin{cases} x = 0 \\ x = \frac{1}{3} \end{cases}$

$S: \{0, \frac{1}{3}\}$

(j) $x^3 - x^2 - 4x + 4 = 0$

$$\Leftrightarrow (x^3 - x^2) - (4x - 4) = 0$$

$$\Leftrightarrow x^2(x-1) - 4(x-1) = 0$$

$$\Leftrightarrow (x-1)(x^2-4) = 0$$

$$\Leftrightarrow (x-1)(x-2)(x+2) = 0$$

$$\Leftrightarrow \begin{cases} x-1 = 0 \\ x-2 = 0 \\ x+2 = 0 \end{cases} \Leftrightarrow \begin{cases} x = 1 \\ x = 2 \\ x = -2 \end{cases}$$

$$S : \{-2, 1, 2\}$$

(k) $12x^4 - 3x^2 + 12x^3 - 3x = 0$

$\Leftrightarrow 3x\left(4x^3 - x + 4x^2 - 1\right) = 0$

$\Leftrightarrow 3x\left[\left(4x^3 - x\right) + \left(4x^2 - 1\right)\right] = 0$

$\Leftrightarrow 3x\left[x\left(4x^2 - 1\right) + \left(4x^2 - 1\right)\right] = 0$

$\Leftrightarrow 3x\left[\left(4x^2 - 1\right)(x + 1)\right] = 0$

$\Leftrightarrow 3x(2x - 1)(2x + 1)(x + 1) = 0$

$\Leftrightarrow \begin{cases} 3x = 0 \\ 2x - 1 = 0 \\ 2x + 1 = 0 \\ x + 1 = 0 \end{cases} \Leftrightarrow \begin{cases} x = 0 \\ x = \frac{1}{2} \\ x = -\frac{1}{2} \\ x = -1 \end{cases}$

$S: \left\{-1, -\frac{1}{2}, 0, \frac{1}{2}\right\}$

(l) $3(2x+3) = x(2x+3)$

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

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

$\Leftrightarrow \begin{cases} 2x+3=0 \\ 3-x=0 \end{cases} \Leftrightarrow \begin{cases} x = -\frac{3}{2} \\ x = 3 \end{cases}$

$S: \left\{ -\frac{3}{2}, 3 \right\}$

(m) $2x(x^2-1) = 3(x^2-1)$

$\Leftrightarrow 2x(x^2-1) - 3(x^2-1) = 0$

$\Leftrightarrow (x^2-1)(2x-3) = 0$

$\Leftrightarrow (x-1)(x+1)(2x-3) = 0$

$\Leftrightarrow \begin{cases} x-1=0 \\ x+1=0 \\ 2x-3=0 \end{cases} \Leftrightarrow \begin{cases} x=1 \\ x=-1 \\ x=\frac{3}{2} \end{cases}$

$S: \left\{ -1, 1, \frac{3}{2} \right\}$

(n) $x^2(4x-1)+9(1-4x)=0$

$\Leftrightarrow x^2(4x-1)-9(4x-1)=0$

$\Leftrightarrow (4x-1)(x^2-9)=0$

$\Leftrightarrow (4x-1)(x-3)(x+3)=0$

$\Leftrightarrow \begin{cases} 4x-1=0 \\ x-3=0 \\ x+3=0 \end{cases} \Leftrightarrow \begin{cases} x=\frac{1}{4} \\ x=3 \\ x=-3 \end{cases}$

$S: \{-3, \frac{1}{4}, 3\}$

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

$\Leftrightarrow (5x+3)(x-7)-(2x+4)(7-x)=0$

$\Leftrightarrow (5x+3)(x-7)+(2x+4)(x-7)=0$

$\Leftrightarrow (x-7)[(5x+3)+(2x+4)]=0$

$\Leftrightarrow (x-7)(7x+7)=0$

$\Leftrightarrow \begin{cases} x-7=0 \\ 7x+7=0 \end{cases} \Leftrightarrow \begin{cases} x=7 \\ x=-1 \end{cases}$

$S: \{-1, 7\}$

(p) $9x^2(2x+5) = 6x(2x+5) - (2x+5)$

$\Leftrightarrow 9x^2(2x+5) - 6x(2x+5) + (2x+5) = 0$

$\Leftrightarrow (2x+5)(9x^2 - 6x + 1) = 0$

$\Leftrightarrow (2x+5)(3x-1)^2 = 0$

$\Leftrightarrow \begin{cases} 2x+5=0 \\ (3x-1)^2 = 0 \end{cases} \Leftrightarrow \begin{cases} x = -\frac{5}{2} \\ 3x-1=0 \end{cases}$

$\Leftrightarrow \begin{cases} x = -\frac{5}{2} \\ x = \frac{1}{3} \end{cases}$

$S : \left\{ -\frac{5}{2}, \frac{1}{3} \right\}$

(q) $3x^3 + 4x^2 = 17x + 6$

$\Leftrightarrow 3x^3 + 4x^2 - 17x - 6 = 0 \quad (1)$

div 6 : $\{ \pm 1, \pm 2, \pm 3, \pm 6 \}$

$P(1) \neq 0$; $P(-1) \neq 0$; $P(2) = 0$

	3	4	-17	-6
2		6	20	6
	3	10	3	0

(1) devient $(x-2)(3x^2 + 10x + 3) = 0 \quad (2)$

div 3 : $\{ \pm 1, \pm 3 \}$

$P(1) \neq 0$; $P(-1) \neq 0$, $P(3) \neq 0$, $P(-3) = 0$

	3	10	3
-3		-9	-3
	3	1	0

(2) devient : $(x-2)(x+3)(3x+1) = 0$

$$\Leftrightarrow \begin{cases} x-2=0 \\ x+3=0 \\ 3x+1=0 \end{cases} \quad \Leftrightarrow \begin{cases} x=2 \\ x=-3 \\ x=-\frac{1}{3} \end{cases}$$

$$S : \left\{-3, -\frac{1}{3}, 2\right\}$$

3 2. Résoudre dans $\mathbb{R}$:

(a) $3x - 2 > 14$

$\Leftrightarrow 3x > 16 \quad \Leftrightarrow x > \frac{16}{3}$

$S :]\frac{16}{3}, +\infty$

(b) $2x + 5 \leq 7$

$\Leftrightarrow 2x \leq 2 \quad \Leftrightarrow x \leq 1$

$S :]-\infty, 1]$

(c) $x - 8 > 5x + 3$

$\Leftrightarrow -4x > 11 \quad \Leftrightarrow x < -\frac{11}{4}$

$S :]-\infty, -\frac{11}{4}[$

(d) $9 + \frac{1}{3}x \geq 4 - \frac{1}{2}x$

$\Leftrightarrow \frac{1}{3}x - \frac{1}{2}x \geq -5 \quad \Leftrightarrow -\frac{1}{6}x \geq -5$

$\Leftrightarrow x \leq 30$

$S :]-\infty, 30]$

(e) $(2x-3)(4x+5) \leq (8x+1)(x-7)$

$\Leftrightarrow 8x^2 + 10x - 12x - 15 \leq 8x^2 - 56x + x - 7$

$\Leftrightarrow -2x + 55x \leq -7 + 15$

$\Leftrightarrow 53x \leq 8$

$\Leftrightarrow x \leq \frac{8}{53}$

$S:]-\infty, \frac{8}{53}]$

(f) $2x(6x+5) < (3x-2)(4x+1)$

$\Leftrightarrow 12x^2 + 10x < 12x^2 + 3x - 8x - 2$

$\Leftrightarrow 10x + 5x < -2$

$\Leftrightarrow 15x < -2$

$\Leftrightarrow x < -\frac{2}{15}$

$S:]-\infty, -\frac{2}{15}[$

(g) $\frac{x-7}{2} - 4x \geq 12 - 6x$

$\Leftrightarrow \frac{x}{2} - 4x + 6x \geq 12 + \frac{7}{2}$

$\Leftrightarrow \frac{x}{2} + 2x \geq \frac{31}{2}$

$\Leftrightarrow \frac{5x}{2} \geq \frac{31}{2}$

$\Leftrightarrow x \geq \frac{31}{5}$

$S: \left[\frac{31}{5}, +\infty\right[$

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

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

$\Leftrightarrow 4 + \frac{2}{3} > 3x + \frac{x}{2}$

$\Leftrightarrow \frac{28}{6} > \frac{21x}{6}$

$\Leftrightarrow \frac{28}{21} > x \quad \Leftrightarrow \frac{4}{3} > x$

$S: \left]-\infty, \frac{4}{3}\right[$

(i) $\frac{x+7}{9} - \frac{3x-2}{2} < \frac{x+4}{18} - 1$

$\Leftrightarrow \frac{2(x+7) - 9(3x-2)}{18} < \frac{x+4-18}{18}$

$\Leftrightarrow 2x + 14 - 27x + 18 < x - 14$

$\Leftrightarrow 2x - 27x - x < -14 - 14 - 18$

$\Leftrightarrow -26x < 46$

$\Leftrightarrow x > \frac{46}{-26}$

$\Leftrightarrow x > -\frac{23}{13}$

$S:]-\frac{23}{13}, +\infty$

(j) $\frac{2x-5}{6} - \frac{x+1}{3} \geq \frac{4x-1}{2}$

$\Leftrightarrow \frac{2x-5-2(x+1)}{6} \geq \frac{3(4x-1)}{6}$

$\Leftrightarrow 2x - 5 - 2x - 2 \geq 12x - 3$

$\Leftrightarrow -7 + 3 \geq 12x$

$\Leftrightarrow -\frac{1}{3} \geq x$

$S: -\infty, -\frac{1}{3}]$

(k) $\frac{1}{5}(-x-12)+\frac{1}{8}(2x-12)>\frac{1}{10}(-5x-12)+\frac{1}{3}(12-3x)$

$\Leftrightarrow \quad \frac{24(-x-12)+15(2x-12)}{120} > \frac{12(-5x-12)+40(12-3x)}{120}$

$\Leftrightarrow \quad -24x-288+30x-180 > -60x-144+480-120x$

$\Leftrightarrow \quad 186x > 804$

$\Leftrightarrow \quad x > \frac{804}{186}$

$\Leftrightarrow \quad x > \frac{134}{31}$

$S: \left]\frac{134}{31}, +\infty\right[$

(l) $\frac{1}{4}(-x-11)+\frac{1}{4}(7x+1) \geq \frac{1}{8}(-6x-3)+\frac{1}{8}(1-5x)$

$\Leftrightarrow \quad \frac{2(-x-11)+2(7x+1)}{8} \geq \frac{-6x-3+1-5x}{8}$

$\Leftrightarrow \quad -2x-22+14x+2 \geq -6x-3+1-5x$

$\Leftrightarrow \quad 23x \geq 18$

$\Leftrightarrow \quad x \geq \frac{18}{23}$

$S: \left[\frac{18}{23}, +\infty\right[$

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3. Résoudre dans $\mathbb{R}$ en variant les techniques :

(a) $\begin{cases} 2x + 3y = 7 \\ 4x + 5y = 9 \end{cases}$

Méthode de substitution : $\begin{cases} x = \frac{7-3y}{2} \quad (1) \\ 4x + 5y = 9 \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ 4 \cdot \frac{7-3y}{2} + 5y = 9 \end{cases} \Leftrightarrow \begin{cases} (1) \\ 2(7-3y) + 5y = 9 \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ 14 - 6y + 5y = 9 \end{cases} \Leftrightarrow \begin{cases} (1) \\ -y = 9 - 14 \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ y = 5 \end{cases} \Leftrightarrow \begin{cases} x = \frac{7-15}{2} \\ y = 5 \end{cases} \Leftrightarrow \begin{cases} x = -4 \\ y = 5 \end{cases}$

$S : \{(-4, 5)\}$

(b) $\begin{cases} 3x - 7y = -2 \\ 4x + 6y = 5 \end{cases}$

Méthode de comparaison : $\begin{cases} x = \frac{-2+7y}{3} & (1) \\ x = \frac{5-6y}{4} \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ \frac{-2+7y}{3} = \frac{5-6y}{4} \end{cases}$ $\Leftrightarrow \begin{cases} (1) \\ 4(-2+7y) = 3(5-6y) \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ -8 + 28y = 15 - 18y \end{cases}$ $\Leftrightarrow \begin{cases} (1) \\ 28y + 18y = 15 + 8 \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ 46y = 23 \end{cases}$ $\Leftrightarrow \begin{cases} x = \frac{-2+\frac{7}{2}}{3} \\ y = \frac{1}{2} \end{cases}$ $\Leftrightarrow \begin{cases} x = \frac{\frac{3}{2}}{3} \\ y = \frac{1}{2} \end{cases}$

$\Leftrightarrow \begin{cases} x = \frac{1}{2} \\ y = \frac{1}{2} \end{cases}$

$S : \left\{ \left(\frac{1}{2}, \frac{1}{2} \right) \right\}$

(c) $\begin{cases} 3x - 10y = -11 \\ 4y + 5x = 23 \end{cases}$

Méthode de combinaison linéaire (combili)

$$\Leftrightarrow \left| \begin{array}{rcl|c|c} 3x & -10y & = -11 & x & y \\ 5x & +4y & = 23 & -5 & 4 \\ & & & 3 & 10 \end{array} \right.$$

x :

$$\begin{cases} -15x + 50y = 55 \\ 15x + 12y = 69 \end{cases}$$

$$0x + 62y = 124$$

$$\Leftrightarrow y = 2$$

y :

$$\begin{cases} 12x - 40y = -44 \\ 50x + 40y = 230 \end{cases}$$

$$62x + 0y = 186$$

$$\Leftrightarrow x = 3$$

$$S : \{(3, 2)\}$$

(d) $\begin{cases} 3x = 7 + y \\ 7y = 1 - 4x \end{cases}$

Méth. de substitution $\Leftrightarrow \begin{cases} 3x - y = 7 \\ 4x + 7y = 1 \end{cases}$

$\Leftrightarrow \begin{cases} y = 3x - 7 \\ 4x + 7(3x - 7) = 1 \end{cases}$ $\Leftrightarrow \begin{cases} (1) \\ 4x + 21x - 49 = 1 \end{cases}$

$\Leftrightarrow \begin{cases} (1) \\ 25x = 50 \end{cases}$ $\Leftrightarrow \begin{cases} y = 6 - 7 \\ x = 2 \end{cases}$ $\Leftrightarrow \begin{cases} y = -1 \\ x = 2 \end{cases}$

$S : \{(2, -1)\}$

(e) $\begin{cases} x + 8y = 9 \\ 2x - 5y = -24 \end{cases}$

Méth de combili

$$\begin{cases} x + 8y = 9 \\ 2x - 5y = -24 \end{cases} \quad \begin{array}{|c|c|} \hline x & y \\ \hline 2 & 5 \\ -1 & 8 \\ \hline \end{array}$$

x

$$\begin{cases} 2x + 16y = 18 \\ -2x + 5y = 24 \end{cases}$$

$$0x + 21y = 42$$

$$\Rightarrow y = 2$$

y

$$\begin{cases} 5x + 40y = 45 \\ 16x - 40y = -192 \end{cases}$$

$$21x + 0y = 147$$

$$\Leftrightarrow x = 7$$

$$S : \{(7, 2)\}$$

(f) $\begin{cases} 6x - 3y = -36 \\ 9x = -31 - 7y \end{cases}$

Combili:

$$\begin{cases} 6x - 3y = -36 \\ 9x + 7y = -31 \end{cases} \qquad \begin{array}{c|c} x & y \\ \hline 3 & 7 \\ -2 & 3 \end{array}$$

x

$$\begin{cases} 18x - 9y = -108 \\ -18x - 14y = 62 \end{cases}$$

$$0x - 23y = -46$$

$$\Leftrightarrow y = 2$$

y

$$\begin{cases} 42x - 21y = -252 \\ 27x + 21y = -93 \end{cases}$$

$$69x + 0y = -345$$

$$\Leftrightarrow x = 5$$

$$S : \{(5, 2)\}$$

(g) $\begin{cases} \frac{t}{3} + \frac{z}{2} = -3 \\ \frac{t}{2} - \frac{z}{5} = 5 \end{cases}$ $\Leftrightarrow \begin{cases} 2t + 3z = -18 \\ 5t - 2z = 50 \end{cases}$

Combili

	x	y
$2t + 3z = -18$	5	2
$5t - 2z = 50$	-2	3

t :

$$\begin{cases} 10t + 15z = -90 \\ -10t + 4z = -100 \end{cases}$$

$$0t + 19z = -190$$

$$\Leftrightarrow z = -10$$

z

$$\begin{cases} 4t + 6z = -36 \\ 15t - 6z = 150 \end{cases}$$

$$19t + 0z = 114$$

$$\Rightarrow t = 6$$

$$S : \{(6, -10)\}$$