

Ecuaciones con denominadores.

a)

$$x + \frac{1}{3} = \frac{x}{3}$$

$$\frac{3x}{3} + \frac{1}{3} = \frac{x}{3}$$

$$\frac{3x+1}{3} = \frac{x}{3}$$

$$3x+1=x$$

$$3x-x=-1$$

$$2x=-1$$

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

b)

$$\frac{5x}{3} + 1 = \frac{5}{6} + x$$

$$\frac{10x}{6} + \frac{6}{6} = \frac{5}{6} + \frac{6x}{6}$$

$$\frac{10x+6}{6} = \frac{5+6x}{6}$$

$$10x+6=5+6x$$

$$10x-6x=5-6$$

$$4x=-1$$

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

c)

$$\frac{3x}{5} - \frac{1}{4} = x - \frac{7x}{10} - \frac{1}{5}$$

$$\frac{12x}{20} - \frac{5}{20} = \frac{20x}{20} - \frac{14x}{20} - \frac{4}{20}$$

$$\frac{12x-5}{20} = \frac{20x-14x-4}{20}$$

$$12x-5=20x-14x-4$$

$$12x-20x+14x=-4+5$$

$$6x=1$$

$$x=\frac{1}{6}$$

d)

$$\frac{x}{3} + \frac{4}{15} - x = \frac{1}{6} - \frac{7x}{10}$$

$$\frac{10x}{30} + \frac{8}{30} - \frac{30x}{30} = \frac{5}{30} - \frac{21x}{30}$$

$$\frac{10x+8-30x}{30} = \frac{5-21x}{30}$$

$$10x+8-30x=5-21x$$

$$-20x+21x=5-8$$

$$x=-3$$

e)

$$\frac{7x}{4} - 1 - \frac{x}{8} = x + \frac{5x}{8} + 1$$

$$\frac{14x}{8} - \frac{8}{8} - \frac{x}{8} = \frac{8x}{8} + \frac{5x}{8} + \frac{8}{8}$$

$$\frac{14x-8-x}{8} = \frac{8x+5x+8}{8}$$

$$14x-8-x=8x+5x+8$$

$$13x-8x-5x=8-8$$

$$0=0$$

Identidad

f)

$$\frac{x}{2} + \frac{1}{6} - \frac{x}{3} = \frac{x}{6} - \frac{2}{3} + \frac{5}{6}$$

$$\frac{3x}{6} + \frac{1}{6} - \frac{2x}{6} = \frac{x}{6} - \frac{4}{6} + \frac{5}{6}$$

$$\frac{3x+1-2x}{6} = \frac{x-4+5}{6}$$

$$3x+1-2x=x-4+5$$

$$x-x=1-6$$

$$0=-5!$$

No tiene solución

Ecuaciones con denominadores y paréntesis.

a)

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

$$2x - \frac{5}{2} = \frac{x}{2} - \frac{3}{2}$$

$$\frac{4x}{2} - \frac{5}{2} = \frac{x}{2} - \frac{3}{2}$$

$$\frac{4x - 5}{2} = \frac{x - 3}{2}$$

$$4x - 5 = x - 3$$

$$4x - x = -3 + 5$$

$$3x = 2$$

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

b)

$$\frac{5}{6}(2x - 1) - x = \frac{x}{6}$$

$$\frac{10x}{6} - \frac{5}{6} - x = \frac{x}{6}$$

$$\frac{10x}{6} - \frac{5}{6} - \frac{6x}{x} = \frac{x}{6}$$

$$\frac{10x - 5 - 6x}{6} = \frac{x}{6}$$

$$10x - 5 - 6x = x$$

$$4x - x = 5$$

$$3x = 5$$

$$x = \frac{5}{3}$$

c)

$$\frac{x}{5} - 1 = 2\left(x - \frac{4}{5}\right)$$

$$\frac{x}{5} - 1 = 2x - \frac{8}{5}$$

$$\frac{x}{5} - \frac{5}{5} = \frac{10x}{5} - \frac{8}{5}$$

$$\frac{x - 5}{5} = \frac{10x - 8}{5}$$

$$x - 5 = 10x - 8$$

$$x - 10x = -8 + 5$$

$$-9x = -3$$

$$x = \frac{-3}{-9}$$

$$x = \frac{1}{3}$$

d)

$$x - \frac{1}{3} = \frac{1}{6}(2x - 5)$$

$$x - \frac{1}{3} = \frac{2x}{6} - \frac{5}{6}$$

$$\frac{6x}{6} - \frac{2}{6} = \frac{2x}{6} - \frac{5}{6}$$

$$\frac{6x - 2}{6} = \frac{2x - 5}{6}$$

$$6x - 2 = 2x - 5$$

$$6x - 2x = -5 + 2$$

$$4x = -3$$

$$x = -\frac{3}{4}$$

Ecuaciones con denominadores y paréntesis.

a)

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

$$\frac{2}{5} + \frac{5x}{5} = \frac{x}{2} - \frac{1}{10}$$

$$\frac{4}{10} + \frac{10x}{10} = \frac{5x}{10} - \frac{1}{10}$$

$$\frac{4+10x}{10} = \frac{5x-1}{10}$$

$$4+10x = 5x-1$$

$$10x-5x = -1-4$$

$$5x = -5$$

$$x = \frac{-5}{5}$$

$$x = -1$$

b)

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

$$2x-6 - \frac{1}{3} = x - \frac{x}{3} + \frac{1}{3}$$

$$\frac{6x}{3} - \frac{18}{3} - \frac{1}{3} = \frac{3x}{3} - \frac{x}{3} + \frac{1}{3}$$

$$\frac{6x-18-1}{3} = \frac{3x-x+1}{3}$$

$$6x-18-1 = 3x-x+1$$

$$6x-3x+x = 1+1+18$$

$$4x = 20$$

$$x = \frac{20}{4}$$

$$x = 5$$

c)

$$1 - \frac{3x}{8} = \frac{3}{4} - \frac{1}{2}(x-2)$$

$$1 - \frac{3x}{8} = \frac{3}{4} - \frac{x}{2} + \frac{2}{2}$$

$$\frac{8}{8} - \frac{3x}{8} = \frac{6}{8} - \frac{4x}{8} + \frac{8}{8}$$

$$\frac{8-3x}{8} = \frac{6-4x+8}{8}$$

$$8-3x = 6-4x+8$$

$$-3x+4x = 14-8$$

$$x = 6$$

d)

$$x - \frac{3x}{4} = \frac{1}{3}(2x-1) + \frac{x}{6}$$

$$x - \frac{3x}{4} = \frac{2x}{3} - \frac{1}{3} + \frac{x}{6}$$

$$\frac{12x}{12} - \frac{9x}{12} = \frac{8x}{12} - \frac{4}{12} + \frac{2x}{12}$$

$$\frac{12x-9x}{12} = \frac{8x-4+2x}{12}$$

$$12x-9x = 8x-4+2x$$

$$3x-8x-2x = -4$$

$$-7x = -4$$

$$x = \frac{4}{7}$$

e)

$$5\left(\frac{x}{4} - \frac{1}{10}\right) = \frac{1}{2}\left(3x - \frac{1}{2}\right)$$

$$\frac{5x}{4} - \frac{5}{10} = \frac{3x}{2} - \frac{1}{4}$$

$$\frac{25x}{20} - \frac{10}{20} = \frac{30x}{20} - \frac{5}{20}$$

$$\frac{25x-10}{20} = \frac{30x-5}{20}$$

$$25x-10=30x-5$$

$$25x-30x=-5+10$$

$$-5x=5$$

$$x = \frac{5}{-5}$$

$$x = -1$$

f)

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

$$1 - \frac{3x}{7} - \frac{3}{7} = \frac{2x}{3} - \frac{1}{7}$$

$$\frac{21}{21} - \frac{9x}{21} - \frac{9}{21} = \frac{14x}{21} - \frac{3}{21}$$

$$\frac{21-9x-9}{21} = \frac{14x-3}{21}$$

$$21-9x-9=14x-3$$

$$-9x-14x=-3-21+9$$

$$-23x=-15$$

$$x = \frac{15}{23}$$

Ecuaciones con numeradores compuestos.

a)

$$x - \frac{x-3}{5} = 1$$

$$\frac{5x}{5} - \frac{x-3}{5} = \frac{5}{5}$$

$$\frac{5x-x+3}{5} = \frac{5}{5}$$

$$5x-x+3=5$$

$$4x=5-3$$

$$x = \frac{2}{4}$$

$$x = \frac{1}{2}$$

b)

$$1 - \frac{x+1}{3} = 2x - \frac{1}{3}$$

$$\frac{3}{3} - \frac{x+1}{3} = \frac{6x}{3} - \frac{1}{3}$$

$$\frac{3-x-1}{3} = \frac{6x-1}{3}$$

$$3-x-1=6x-1$$

$$-x-6x=-1+1-3$$

$$-7x=-3$$

$$x = \frac{3}{7}$$

c)

$$1 - \frac{1-x}{3} = x + \frac{1}{2}$$

$$\frac{6}{6} - \frac{2-2x}{6} = \frac{6x}{6} + \frac{3}{6}$$

$$\frac{6-2+2x}{6} = \frac{6x+3}{6}$$

$$6-2+2x = 6x+3$$

$$2x-6x = 3-6+2$$

$$-4x = -1$$

$$x = \frac{1}{4}$$

e)

$$\frac{3x-1}{2} - 1 = 2x - 2$$

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

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

$$3x-1-2 = 4x-4$$

$$3x-4x = -4+1+2$$

$$-x = -1$$

$$x = 1$$

g)

$$2x + \frac{x-3}{2} = \frac{x-3}{4}$$

$$\frac{8x}{4} + \frac{2x-6}{4} = \frac{x-3}{4}$$

$$\frac{8x+2x-6}{4} = \frac{x-3}{4}$$

$$8x+2x-6 = x-3$$

$$10x-x = -3+6$$

$$9x = 3$$

$$x = \frac{3}{9}$$

$$x = \frac{1}{3}$$

d)

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

$$\frac{6x}{4} - \frac{4}{4} = \frac{3x+2}{4}$$

$$\frac{6x-4}{4} = \frac{3x+2}{4}$$

$$6x-4 = 3x+2$$

$$6x-3x = 2+4$$

$$3x = 6$$

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

$$x = 2$$

f)

$$x + \frac{2-3x}{5} = \frac{x}{2} + 1$$

$$\frac{10x}{10} + \frac{4-6x}{10} = \frac{5x}{10} + \frac{10}{10}$$

$$\frac{10x+4-6x}{10} = \frac{5x+10}{10}$$

$$10x+4-6x = 5x+10$$

$$4x-5x = 10-4$$

$$-x = 6$$

$$x = -6$$

h)

$$\frac{3x}{5} - 1 = x - \frac{x+1}{2}$$

$$\frac{6x}{10} - \frac{10}{10} = \frac{10x}{10} - \frac{5x+5}{10}$$

$$\frac{6x-10}{10} = \frac{10x-5x-5}{10}$$

$$6x-10 = 10x-5x-5$$

$$6x-10x+5x = -5+10$$

$$x = 5$$

i)

$$\begin{aligned}\frac{x}{5} - \frac{x+2}{15} &= \frac{x}{3} \\ \frac{3x}{15} - \frac{x+2}{15} &= \frac{5x}{15} \\ \frac{3x-x-2}{15} &= \frac{5x}{15} \\ 3x-x-2 &= 5x \\ 2x-5x &= 2 \\ -3x &= 2 \\ x &= -\frac{2}{3}\end{aligned}$$

k)

$$\begin{aligned}\frac{x+3}{5} - \frac{x-6}{7} &= 1 \\ \frac{7x+21}{35} - \frac{5x-30}{35} &= \frac{35}{35} \\ \frac{7x+21-5x+30}{35} &= \frac{35}{35} \\ 7x+21-5x+30 &= 35 \\ 2x &= 35-21-30 \\ 2x &= -16 \\ x &= \frac{-16}{2} \\ x &= -8\end{aligned}$$

j)

$$\begin{aligned}\frac{x-5}{3} + \frac{x-2}{5} &= x-2 \\ \frac{5x-25}{15} + \frac{3x-6}{15} &= \frac{15x}{15} - \frac{30}{15} \\ \frac{5x-25+3x-6}{15} &= \frac{15x-30}{15} \\ 5x-25+3x-6 &= 15x-30 \\ 8x-15x &= -30+25+6 \\ -7x &= 1 \\ x &= -\frac{1}{7}\end{aligned}$$

l)

$$\begin{aligned}\frac{1-x}{3} - \frac{x-1}{12} &= \frac{3x-1}{4} \\ \frac{4-4x}{12} - \frac{x-1}{12} &= \frac{9x-3}{12} \\ \frac{4-4x-x+1}{12} &= \frac{9x-3}{12} \\ 4-4x-x+1 &= 9x-3 \\ -5x-9x &= -3-4-1 \\ -14x &= -8 \\ x &= \frac{-8}{-14} \\ x &= \frac{4}{7}\end{aligned}$$

Ecuaciones con fracciones con numerador compuesto y con paréntesis.

a)

$$\begin{aligned}\frac{3x-1}{4} - \frac{2x+1}{5} &= \frac{7x-13}{20} \\ \frac{15x-5}{20} - \frac{8x+4}{20} &= \frac{7x-13}{20} \\ \frac{15x-5-8x-4}{20} &= \frac{7x-13}{20} \\ 15x-5-8x-4 &= 7x-13 \\ 7x-7x &= -13+5+4 \\ 0 &= -4 ! \\ \text{No tiene solución}\end{aligned}$$

b)

$$\begin{aligned}2 + \frac{2}{5}(x+1) &= x - \frac{2x+3}{5} \\ 2 + \frac{2x}{5} + \frac{2}{5} &= x - \frac{2x+3}{5} \\ \frac{10}{5} + \frac{2x}{5} + \frac{2}{5} &= \frac{5x}{5} - \frac{2x+3}{5} \\ \frac{10+2x+2}{5} &= \frac{5x-2x-3}{5} \\ 10+2x+2 &= 5x-2x-3 \\ 2x-5x+2x &= -3-10-2 \\ -x &= -15 \\ x &= 15\end{aligned}$$

d)

$$\frac{2}{3}(1-3x) + \frac{3(x-1)}{4} = \frac{5}{12}(1-x)$$

$$\frac{2}{3} - \frac{6x}{3} + \frac{3x-3}{4} = \frac{5}{12} - \frac{5x}{12}$$

$$\frac{8}{12} - \frac{24x}{12} + \frac{9x-9}{12} = \frac{5}{12} - \frac{5x}{12}$$

$$\frac{8-24x+9x-9}{12} = \frac{5-5x}{12}$$

$$8-24x+9x-9 = 5-5x$$

$$-15x+5x = 5-8+9$$

$$-10x = 6$$

$$x = \frac{6}{-10}$$

$$x = -\frac{3}{5}$$

e)

$$\frac{3}{5}\left(\frac{x-1}{3}+1\right) + x = \frac{3}{4}\left(x-\frac{2}{3}\right)$$

$$\frac{3x-3}{15} + \frac{3}{5} + x = \frac{3x}{4} - \frac{6}{12}$$

$$\frac{12x-12}{60} + \frac{36}{60} + \frac{60x}{60} = \frac{45x}{60} - \frac{30}{60}$$

$$\frac{12x-12+36+60x}{60} = \frac{45x-30}{60}$$

$$12x-12+36+60x = 45x-30$$

$$72x-45x = -30+12-36$$

$$27x = -54$$

$$x = \frac{-54}{27}$$

$$x = -2$$