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)

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

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

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

$$3x + 6 - 2x = x - 4 + 5$$

$$x - x = 1 - 6$$

$$0 = -5 \ !$$

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)

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

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

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

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

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

$$-4x = -1$$

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

d)

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

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

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

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

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

$$3x = 6$$

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

$$x = 2$$

e)

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

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

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

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

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

$$-x = -1$$

$$x = 1$$

f)

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

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

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

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

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

$$-x = 6$$

$$x = -6$$

g)

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

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

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

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

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

$$9x = 3$$

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

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

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)

$$\frac{x}{5} - \frac{x+2}{15} = \frac{x}{3}$$

$$\frac{3x}{15} - \frac{x+2}{15} = \frac{5x}{15}$$

$$\frac{3x-x-2}{15} = \frac{5x}{15}$$

$$3x - x - 2 = 5x$$

$$2x - 5x = 2$$

$$-3x = 2$$

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

j)

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

$$\frac{5x-25}{15} + \frac{3x-6}{15} = \frac{15x}{15} - \frac{30}{15}$$

$$\frac{5x-25+3x-6}{15} = \frac{15x-30}{15}$$

$$5x - 25 + 3x - 6 = 15x - 30$$

$$8x - 15x = -30 + 25 + 6$$

$$-7x = 1$$

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

k)

$$\frac{x+3}{5} - \frac{x-6}{7} = 1$$

$$\frac{7x+21}{35} - \frac{5x-30}{35} = \frac{35}{35}$$

$$\frac{7x+21-5x+30}{35} = \frac{35}{35}$$

$$7x + 21 - 5x + 30 = 35$$

$$2x = 35 - 21 - 30$$

$$2x = -16$$

$$x = \frac{-16}{2}$$

$$x = -8$$

l)

$$\frac{1-x}{3} - \frac{x-1}{12} = \frac{3x-1}{4}$$

$$\frac{4-4x}{12} - \frac{x-1}{12} = \frac{9x-3}{12}$$

$$\frac{4-4x-x+1}{12} = \frac{9x-3}{12}$$

$$4 - 4x - x + 1 = 9x - 3$$

$$-5x - 9x = -3 - 4 - 1$$

$$-14x = -8$$

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

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

Ecuaciones con fracciones con numerador compuesto y con paréntesis.

a)

$$\frac{3x-1}{4} - \frac{2x+1}{5} = \frac{7x-13}{20}$$

$$\frac{15x-5}{20} - \frac{8x+4}{20} = \frac{7x-13}{20}$$

$$\frac{15x-5-8x-4}{20} = \frac{7x-13}{20}$$

$$15x - 5 - 8x - 4 = 7x - 13$$

$$7x - 7x = -13 + 5 + 4$$

$$0 = -4 \ !$$

No tiene solución

b)

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

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

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

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

$$10 + 2x + 2 = 5x - 2x - 3$$

$$2x - 5x + 2x = -3 - 10 - 2$$

$$-x = -15$$

$$x = 15$$

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)

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

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

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

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

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

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

$$27x=-54$$

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

$$x=-2$$