

Exercises for the Algebra of Fractions

Exercise Set I. Combine the given expressions into one simple fraction.

(I.1) $\frac{4}{3} - \frac{3}{x}$ Solution

(I.2) $\frac{1}{4}(x+2) + \frac{3}{x+3}$ Solution

(I.3) $\frac{\left(\frac{x}{x+2}\right)}{5} + 1$ Solution

(I.4) $\frac{x}{\left(\frac{x+3}{2}\right)} - 1$ Solution

(I.5) $\frac{3-2x^2}{3(c+1)^2(x+1)^2} + \frac{x+2}{(c+1)^2(x+1)}$ Solution

(I.6) $\frac{a+1}{a-1} + \frac{a-1}{a+1}$ Solution

(I.7) $\frac{-3}{y+1} + \frac{3}{y}$ Solution

(I.8) $\frac{1}{x+h} - \frac{1}{x}$ Solution

(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$ Solution

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Exercise Set II. Simplify:

(II.1) $\frac{a}{b} + \frac{b}{a}$ Solution

(II.2) $\frac{a}{b} + \frac{b}{c} + \frac{c}{a}$ Solution

(II.3) $\frac{a}{b} + \frac{b}{c} + \frac{c}{d} + \frac{d}{a}$ Solution

(II.4) $\frac{1}{R_1} + \frac{1}{R_2}$ Solution

(II.5) $\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$ Solution

(II.6) $\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$ Solution

(II.7) $\frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$ Solution

(II.8) $\frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$ Solution

(II.9) $\frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}}$ Solution

(II.10) $\frac{a}{a+b} + \frac{b}{a+b}$ Solution

(II.11) $\frac{a}{a+b} - \frac{a}{a+b}$ Solution

(II.12) $\frac{a}{a+b} + \frac{b}{a-b}$ Solution

(II.13) $\frac{a}{a+b} - \frac{b}{a-b}$ Solution

(II.14) $\frac{2}{ax+b} + \frac{1}{ax-b}$ Solution

(II.15) $\frac{2}{5x} - \frac{3}{7x} = 2$ Solution

(II.16) $\frac{2x}{5} - \frac{3x}{7} = 2$ Solution

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Solution Set I.

$$(I.1) \quad \frac{4}{3} - \frac{3}{x} =$$

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Solution Set I.

$$(I.1) \quad \frac{4}{3} - \frac{3}{x} =$$

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

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Solution Set I.

$$(I.1) \quad \frac{4}{3} - \frac{3}{x} =$$

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

$$\frac{4x - 9}{3x}$$

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$$(1.2) \quad \frac{1}{4}(x+2) + \frac{3}{x+3} =$$

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$$(1.2) \quad \frac{1}{4}(x+2) + \frac{3}{x+3} =$$

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

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$$(1.2) \quad \frac{1}{4}(x+2) + \frac{3}{x+3} =$$

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

$$\frac{(x+2)(x+3) + 4 \cdot 3}{4(x+3)} =$$

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$$(1.2) \quad \frac{1}{4}(x+2) + \frac{3}{x+3} =$$

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

$$\frac{(x+2)(x+3) + 4 \cdot 3}{4(x+3)} =$$

$$\frac{x^2 + (2+3)x + 2 \cdot 3 + 12}{4(x+3)} =$$

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$$(1.2) \quad \frac{1}{4}(x+2) + \frac{3}{x+3} =$$

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

$$\frac{(x+2)(x+3) + 4 \cdot 3}{4(x+3)} =$$

$$\frac{x^2 + (2+3)x + 2 \cdot 3 + 12}{4(x+3)} =$$

$$\frac{x^2 + 5x + 6 + 12}{4(x+3)} =$$

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$$(I.2) \quad \frac{1}{4}(x+2) + \frac{3}{x+3} =$$

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

$$\frac{(x+2)(x+3) + 4 \cdot 3}{4(x+3)} =$$

$$\frac{x^2 + (2+3)x + 2 \cdot 3 + 12}{4(x+3)} =$$

$$\frac{x^2 + 5x + 6 + 12}{4(x+3)} =$$

$$\frac{x^2 + 5x + 18}{4(x+3)}$$

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

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$$(I.3) \quad \frac{\left(\frac{x}{x+2}\right)}{5} + 1 =$$

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

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$$(I.3) \quad \frac{\left(\frac{x}{x+2}\right)}{5} + 1 =$$

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

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

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$$(I.3) \quad \frac{\left(\frac{x}{x+2}\right)}{5} + 1 =$$

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

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

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

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$$(I.3) \quad \frac{\left(\frac{x}{x+2}\right)}{5} + 1 =$$

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

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

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

$$\frac{x + 5x + 5 \cdot 2}{5(x + 2)} =$$

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$$(I.3) \quad \frac{\left(\frac{x}{x+2}\right)}{5} + 1 =$$

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

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

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

$$\frac{x + 5x + 5 \cdot 2}{5(x + 2)} =$$

$$\frac{6x + 10}{5(x + 2)} =$$

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$$(I.3) \quad \frac{\left(\frac{x}{x+2}\right)}{5} + 1 =$$

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

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

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

$$\frac{x + 5x + 5 \cdot 2}{5(x + 2)} =$$

$$\frac{6x + 10}{5(x + 2)} =$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(I.5) $\frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3(x + 1)(x + 2)}{3(x + 1)} \right] =$$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3(x + 1)(x + 2)}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + (1 + 2)x + 1 \cdot 2]}{3(x + 1)} \right] =$$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3(x + 1)(x + 2)}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + (1 + 2)x + 1 \cdot 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + 3x + 2]}{3(x + 1)} \right] =$$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3(x + 1)(x + 2)}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + (1 + 2)x + 1 \cdot 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + 3x + 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3x^2 + 9x + 6}{3(x + 1)} \right] =$$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3(x + 1)(x + 2)}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + (1 + 2)x + 1 \cdot 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + 3x + 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3x^2 + 9x + 6}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2 + 3x^2 + 9x + 6}{3(x + 1)} \right] =$$

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$$(I.5) \quad \frac{3 - 2x^2}{3(c + 1)^2(x + 1)^2} + \frac{x + 2}{(c + 1)^2(x + 1)} =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + x + 2 \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3(x + 1)(x + 2)}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + (1 + 2)x + 1 \cdot 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3[x^2 + 3x + 2]}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2}{3(x + 1)} + \frac{3x^2 + 9x + 6}{3(x + 1)} \right] =$$

$$\frac{1}{(c + 1)^2(x + 1)} \left[\frac{3 - 2x^2 + 3x^2 + 9x + 6}{3(x + 1)} \right] =$$

$$\frac{x^2 + 9x + 9}{3(c + 1)^2(x + 1)^2}$$

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$$(I.6) \quad \frac{a+1}{a-1} + \frac{a-1}{a+1} =$$

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$$(I.6) \quad \frac{a+1}{a-1} + \frac{a-1}{a+1} = \frac{(a+1)(a+1) + (a-1)(a-1)}{(a-1)(a+1)} =$$

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$$(I.6) \quad \frac{a+1}{a-1} + \frac{a-1}{a+1} = \frac{(a+1)(a+1) + (a-1)(a-1)}{(a-1)(a+1)} =$$

$$\frac{a^2 + 2a + 1 + a^2 - 2a + 1}{a^2 - 1} =$$

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$$(I.6) \quad \frac{a+1}{a-1} + \frac{a-1}{a+1} = \frac{(a+1)(a+1) + (a-1)(a-1)}{(a-1)(a+1)} =$$

$$\frac{a^2 + 2a + 1 + a^2 - 2a + 1}{a^2 - 1} =$$

$$\frac{2a^2 + 2}{a^2 - 1}$$

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$$(I.7) \quad \frac{-3}{y+1} + \frac{3}{y} =$$

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$$(I.7) \quad \frac{-3}{y+1} + \frac{3}{y} = \frac{3}{y} \left[\frac{-1}{y+1} + 1 \right] =$$

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$$\text{(I.7)} \quad \frac{-3}{y+1} + \frac{3}{y} = \frac{3}{y} \left[\frac{-1}{y+1} + 1 \right] =$$
$$\frac{3}{y} \left[\frac{-1+y+1}{y+1} \right] =$$

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$$\begin{aligned} \text{(I.7)} \quad \frac{-3}{y+1} + \frac{3}{y} &= \frac{3}{y} \left[\frac{-1}{y+1} + 1 \right] = \\ \frac{3}{y} \left[\frac{-1+y+1}{y+1} \right] &= \\ \frac{3}{y} \left[\frac{y}{y+1} \right] &= \end{aligned}$$

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$$(I.7) \quad \frac{-3}{y+1} + \frac{3}{y} = \frac{3}{y} \left[\frac{-1}{y+1} + 1 \right] =$$

$$\frac{3}{y} \left[\frac{-1+y+1}{y+1} \right] =$$

$$\frac{3}{y} \left[\frac{y}{y+1} \right] =$$

$$\frac{3}{y+1}$$

(I.8) $\frac{\frac{1}{x+h} - \frac{1}{x}}{h} =$

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$$(I.8) \quad \frac{\frac{1}{x+h} - \frac{1}{x}}{h} =$$

$$\frac{1 \cdot x - (x+h) \cdot 1}{(x+h)x} =$$
$$\frac{1 \cdot x - (x+h) \cdot 1}{h} =$$

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$$(I.8) \quad \frac{\frac{1}{x+h} - \frac{1}{x}}{h} =$$

$$\frac{1 \cdot x - (x+h) \cdot 1}{(x+h)x} =$$
$$\frac{1 \cdot x - (x+h) \cdot 1}{h} =$$

$$\frac{x - (x+h)}{(x+h)x} =$$
$$\frac{-h}{(x+h)x} =$$

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$$(I.8) \quad \frac{\frac{1}{x+h} - \frac{1}{x}}{h} =$$

$$\frac{1 \cdot x - (x+h) \cdot 1}{(x+h)x} =$$
$$\frac{1 \cdot x - (x+h) \cdot 1}{h} =$$

$$\frac{x - (x+h)}{h} =$$

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

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$$(I.8) \quad \frac{\frac{1}{x+h} - \frac{1}{x}}{h} =$$

$$\frac{1 \cdot x - (x+h) \cdot 1}{(x+h)x} =$$
$$\frac{1 \cdot x - (x+h) \cdot 1}{h} =$$

$$\frac{x - (x+h)}{(x+h)x} =$$
$$\frac{x - x - h}{(x+h)x} =$$

$$\frac{-h}{(x+h)x} =$$

$$\frac{-h}{(x+h)x} =$$
$$\frac{-h}{h} =$$

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$$(I.8) \quad \frac{\frac{1}{x+h} - \frac{1}{x}}{h} =$$

$$\frac{1 \cdot x - (x+h) \cdot 1}{(x+h)x} =$$

$$\frac{x - (x+h)}{(x+h)x} =$$

$$\frac{x - x - h}{(x+h)x} =$$

$$\frac{-h}{(x+h)x} =$$

$$\frac{-1}{(x+h)x}$$

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(I.9)

Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

$$(x^2 + (2+5)x + 2 \cdot 5) - 15x - 15 \cdot (-5) = x^2 - 5^2$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

$$(x^2 + (2+5)x + 2 \cdot 5) - 15x - 15 \cdot (-5) = x^2 - 5^2$$

$$x^2 + 7x + 10 - 15x + 75 = x^2 - 25$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

$$(x^2 + (2+5)x + 2 \cdot 5) - 15x - 15 \cdot (-5) = x^2 - 5^2$$

$$x^2 + 7x + 10 - 15x + 75 = x^2 - 25$$

$$10 - 8x + 75 = -25$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

$$(x^2 + (2+5)x + 2 \cdot 5) - 15x - 15 \cdot (-5) = x^2 - 5^2$$

$$x^2 + 7x + 10 - 15x + 75 = x^2 - 25$$

$$10 - 8x + 75 = -25$$

$$-8x = -110,$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

$$(x^2 + (2+5)x + 2 \cdot 5) - 15x - 15 \cdot (-5) = x^2 - 5^2$$

$$x^2 + 7x + 10 - 15x + 75 = x^2 - 25$$

$$10 - 8x + 75 = -25$$

$$-8x = -110,$$

$$x = \frac{-110}{-8} =$$

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(I.9) Solve for x : $\frac{x+2}{x-5} - \frac{15}{x+5} = 1$

$$\frac{(x+2)(x+5) - 15(x-5)}{(x-5)(x+5)} = 1$$

$$(x+2)(x+5) - 15(x-5) = (x-5)(x+5)$$

$$(x^2 + (2+5)x + 2 \cdot 5) - 15x - 15 \cdot (-5) = x^2 - 5^2$$

$$x^2 + 7x + 10 - 15x + 75 = x^2 - 25$$

$$10 - 8x + 75 = -25$$

$$-8x = -110,$$

$$x = \frac{-110}{-8} =$$

$$\frac{55}{4}$$

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Solution Set II.

$$(II.1) \quad \frac{a}{b} + \frac{b}{a} =$$

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Solution Set II.

$$(II.1) \quad \frac{a}{b} + \frac{b}{a} =$$

$$\frac{a}{b} \frac{a}{a} + \frac{b}{a} \frac{b}{b} =$$

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Solution Set II.

$$(II.1) \quad \frac{a}{b} + \frac{b}{a} =$$

$$\frac{a}{b} \frac{a}{a} + \frac{b}{a} \frac{b}{b} =$$

$$\frac{a(a)}{b(a)} + \frac{b(b)}{a(b)} =$$

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Solution Set II.

$$(II.1) \quad \frac{a}{b} + \frac{b}{a} =$$

$$\frac{a}{b} \frac{a}{a} + \frac{b}{a} \frac{b}{b} =$$

$$\frac{a(a)}{b(a)} + \frac{b(b)}{a(b)} =$$

$$\frac{a^2}{ab} + \frac{b^2}{ab} =$$

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Solution Set II.

$$(II.1) \quad \frac{a}{b} + \frac{b}{a} =$$

$$\frac{a}{b} \frac{a}{a} + \frac{b}{a} \frac{b}{b} =$$

$$\frac{a(a)}{b(a)} + \frac{b(b)}{a(b)} =$$

$$\frac{a^2}{ab} + \frac{b^2}{ab} =$$

$$\frac{a^2 + b^2}{ab}$$

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$$(II.2) \quad \frac{a}{b} + \frac{b}{c} + \frac{c}{a} =$$

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$$\text{(II.2)} \quad \frac{a}{b} + \frac{b}{c} + \frac{c}{a} =$$

$$\frac{a}{b} \left(\frac{ac}{ac} \right) + \frac{b}{c} \left(\frac{ab}{ab} \right) + \frac{c}{a} \left(\frac{bc}{bc} \right) =$$

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$$(II.2) \quad \frac{a}{b} + \frac{b}{c} + \frac{c}{a} =$$

$$\frac{a}{b} \left(\frac{ac}{ac} \right) + \frac{b}{c} \left(\frac{ab}{ab} \right) + \frac{c}{a} \left(\frac{bc}{bc} \right) =$$

$$\frac{a^2c + ab^2 + bc^2}{abc}$$

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$$(II.3) \quad \frac{a}{b} + \frac{b}{c} + \frac{c}{d} + \frac{d}{a} =$$

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$$\text{(II.3)} \quad \frac{a}{b} + \frac{b}{c} + \frac{c}{d} + \frac{d}{a} =$$

$$\frac{a}{b} \left(\frac{acd}{acd} \right) + \frac{b}{c} \left(\frac{abd}{abd} \right) + \frac{c}{d} \left(\frac{abc}{abc} \right) + \frac{d}{a} \left(\frac{bcd}{bcd} \right) =$$

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$$(II.3) \quad \frac{a}{b} + \frac{b}{c} + \frac{c}{d} + \frac{d}{a} =$$

$$\frac{a}{b} \left(\frac{acd}{acd} \right) + \frac{b}{c} \left(\frac{abd}{abd} \right) + \frac{c}{d} \left(\frac{abc}{abc} \right) + \frac{d}{a} \left(\frac{bcd}{bcd} \right) =$$

$$\frac{a^2cd + ab^2d + abc^2 + bcd^2}{abcd}$$

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$$\text{(II.4)} \quad \frac{1}{R_1} + \frac{1}{R_2} =$$

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$$\text{(II.4)} \quad \frac{1}{R_1} + \frac{1}{R_2} =$$

$$\frac{1}{R_1} \frac{R_2}{R_2} + \frac{1}{R_2} \frac{R_1}{R_1} =$$

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$$\text{(II.4)} \quad \frac{1}{R_1} + \frac{1}{R_2} =$$

$$\frac{1}{R_1} \frac{R_2}{R_2} + \frac{1}{R_2} \frac{R_1}{R_1} =$$

$$\frac{R_1 + R_2}{R_1 R_2}$$

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$$\text{(II.5)} \quad \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} =$$

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$$\text{(II.5)} \quad \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} =$$
$$\frac{1}{R_1} \frac{R_2 R_3}{R_2 R_3} + \frac{1}{R_2} \frac{R_1 R_3}{R_1 R_3} + \frac{1}{R_3} \frac{R_1 R_2}{R_1 R_2} =$$

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$$\begin{aligned} \text{(II.5)} \quad & \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \\ & \frac{1}{R_1} \frac{R_2 R_3}{R_2 R_3} + \frac{1}{R_2} \frac{R_1 R_3}{R_1 R_3} + \frac{1}{R_3} \frac{R_1 R_2}{R_1 R_2} = \\ & \frac{R_1 R_2 + R_1 R_3 + R_2 R_3}{R_1 R_2 R_3} \end{aligned}$$

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$$\text{(II.6)} \quad \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} =$$

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$$\text{(II.6)} \quad \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} =$$
$$\frac{1}{R_1} \frac{R_2 R_3 R_4}{R_2 R_3 R_4} + \frac{1}{R_2} \frac{R_1 R_3 R_4}{R_1 R_3 R_4} + \frac{1}{R_3} \frac{R_1 R_2 R_4}{R_1 R_2 R_4} + \frac{1}{R_4} \frac{R_1 R_2 R_3}{R_1 R_2 R_3} =$$

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$$\text{(II.6)} \quad \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} =$$
$$\frac{1}{R_1} \frac{R_2 R_3 R_4}{R_2 R_3 R_4} + \frac{1}{R_2} \frac{R_1 R_3 R_4}{R_1 R_3 R_4} + \frac{1}{R_3} \frac{R_1 R_2 R_4}{R_1 R_2 R_4} + \frac{1}{R_4} \frac{R_1 R_2 R_3}{R_1 R_2 R_3} =$$

$$\frac{R_1 R_2 R_3 + R_1 R_2 R_4 + R_1 R_3 R_4 + R_2 R_3 R_4}{R_1 R_2 R_3 R_4}$$

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$$\text{(II.7)} \quad \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} =$$

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$$(II.7) \quad \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}} =$$

$$\frac{R_1 R_2}{R_1 + R_2}$$

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$$(II.8) \quad \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} =$$

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$$(II.8) \quad \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} = \frac{R_1 R_2 R_3}{R_1 R_2 + R_1 R_3 + R_2 R_3}$$

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$$(II.9) \quad \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}} =$$

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$$(II.9) \quad \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}} = \frac{R_1 R_2 R_3 R_4}{R_1 R_2 R_3 + R_1 R_2 R_4 + R_1 R_3 R_4 + R_2 R_3 R_4}$$

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$$(II.10) \quad \frac{a}{a+b} + \frac{b}{a+b} =$$

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$$\text{(II.10)} \quad \frac{a}{a+b} + \frac{b}{a+b} =$$

$$\frac{a+b}{a+b} =$$

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$$\text{(II.10)} \quad \frac{a}{a+b} + \frac{b}{a+b} =$$

$$\frac{a+b}{a+b} = 1$$

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$$\text{(II.11)} \quad \frac{a}{a+b} - \frac{a}{a+b} =$$

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$$\text{(II.11)} \quad \frac{a}{a+b} - \frac{a}{a+b} =$$

$$\frac{a-a}{a+b} =$$

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$$\text{(II.11)} \quad \frac{a}{a+b} - \frac{a}{a+b} =$$

$$\frac{a-a}{a+b} =$$

0

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$$(II.12) \quad \frac{a}{a+b} + \frac{b}{a-b} =$$

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$$\text{(II.12)} \quad \frac{a}{a+b} + \frac{b}{a-b} =$$

$$\frac{a(a-b) + b(a+b)}{(a+b)(a-b)} =$$

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$$\text{(II.12)} \quad \frac{a}{a+b} + \frac{b}{a-b} =$$

$$\frac{a(a-b) + b(a+b)}{(a+b)(a-b)} =$$

$$\frac{a^2 + b^2}{a^2 - b^2}$$

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$$(II.13) \quad \frac{a}{a+b} - \frac{b}{a-b} =$$

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$$\text{(II.13)} \quad \frac{a}{a+b} - \frac{b}{a-b} =$$

$$\frac{a(a-b) - b(a+b)}{(a+b)(a-b)} =$$

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$$\text{(II.13)} \quad \frac{a}{a+b} - \frac{b}{a-b} =$$

$$\frac{a(a-b) - b(a+b)}{(a+b)(a-b)} =$$

$$\frac{a^2 - 2ab - b^2}{a^2 - b^2}$$

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$$\text{(II.14)} \quad \frac{2}{ax+b} + \frac{1}{ax-b} =$$

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$$\text{(II.14)} \quad \frac{2}{ax+b} + \frac{1}{ax-b} =$$

$$\frac{2(ax-b) + 1(ax+b)}{(ax-b)(ax+b)} =$$

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$$\text{(II.14)} \quad \frac{2}{ax+b} + \frac{1}{ax-b} =$$

$$\frac{2(ax-b) + 1(ax+b)}{(ax-b)(ax+b)} =$$

$$\frac{2ax - 2b + ax + b}{a^2x^2 - b^2} =$$

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$$\text{(II.14)} \quad \frac{2}{ax+b} + \frac{1}{ax-b} =$$

$$\frac{2(ax-b) + 1(ax+b)}{(ax-b)(ax+b)} =$$

$$\frac{2ax - 2b + ax + b}{a^2x^2 - b^2} =$$

$$\frac{3ax - b}{a^2x^2 - b^2}$$

(II.15)

Solve for x :

$$\frac{2}{5x} - \frac{3}{7x} = 2.$$

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(II.15)

Solve for x :

$$\frac{2}{5x} - \frac{3}{7x} = 2.$$

$$\frac{1}{x} \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

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(II.15)

Solve for x :

$$\frac{2}{5x} - \frac{3}{7x} = 2.$$

$$\frac{1}{x} \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$\left(\frac{2(7) - 3(5)}{5(7)} \right) = 2x.$$

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(II.15)

Solve for x :

$$\frac{2}{5x} - \frac{3}{7x} = 2.$$

$$\frac{1}{x} \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$\left(\frac{2(7) - 3(5)}{5(7)} \right) = 2x.$$

$$\frac{14 - 15}{35} = 2x.$$

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(II.15)

Solve for x :

$$\frac{2}{5x} - \frac{3}{7x} = 2.$$

$$\frac{1}{x} \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$\left(\frac{2(7) - 3(5)}{5(7)} \right) = 2x.$$

$$\frac{14 - 15}{35} = 2x.$$

$$\frac{-1}{2(35)} = x.$$

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(II.15)

Solve for x :

$$\frac{2}{5x} - \frac{3}{7x} = 2.$$

$$\frac{1}{x} \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$\left(\frac{2(7) - 3(5)}{5(7)} \right) = 2x.$$

$$\frac{14 - 15}{35} = 2x.$$

$$\frac{-1}{2(35)} = x.$$

$$x = -\frac{1}{70}$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

$$x \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

$$x \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$x \left(\frac{2(7) - 3(5)}{5(7)} \right) = 2.$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

$$x \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$x \left(\frac{2(7) - 3(5)}{5(7)} \right) = 2.$$

$$x \frac{14 - 15}{35} = 2.$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

$$x \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$x \left(\frac{2(7) - 3(5)}{5(7)} \right) = 2.$$

$$x \frac{14 - 15}{35} = 2.$$

$$x = \frac{2}{\frac{-1}{35}}.$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

$$x \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$x \left(\frac{2(7) - 3(5)}{5(7)} \right) = 2.$$

$$x \frac{14 - 15}{35} = 2.$$

$$x = \frac{2}{\frac{-1}{35}}.$$

$$x = 2 \frac{35}{-1}.$$

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(II.16)

Solve for x :

$$\frac{2x}{5} - \frac{3x}{7} = 2.$$

$$x \left(\frac{2}{5} - \frac{3}{7} \right) = 2.$$

$$x \left(\frac{2(7) - 3(5)}{5(7)} \right) = 2.$$

$$x \frac{14 - 15}{35} = 2.$$

$$x = \frac{2}{\frac{-1}{35}}.$$

$$x = 2 \frac{35}{-1}.$$

$$x = -70$$

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