

Rational Functions

Subtracting and Dividing

Subtracting

1. Common Denominator
2. Distribute the minus sign

How to subtract rational functions

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

Find the mistake

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

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

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

$$\frac{3x-5-(x+7)}{2x+1} = \frac{3x-5-x-7}{2x+1} = \frac{2x-12}{2x+1}$$

~~$$\frac{2x-12}{2x+1}$$~~

$$\frac{(2x-12)}{(2x+1)} = \frac{2(x-6)}{(2x+1)}$$

answer

~~$$\frac{2x \cdot y}{2x \cdot z}$$~~

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

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

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

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

$$\begin{aligned} & (3x^2 + 2x) - (2x^2 + 2x - 5x - 5) \\ & (3x^2 + 2x) - (2x^2 - 3x - 5) \\ & 3x^2 + 2x - 2x^2 + 3x + 5 \\ & x^2 + 5x + 5 \end{aligned}$$

$$\frac{x^2 + 5x + 5}{(x)(x+1)} \quad \text{answer}$$

$$\begin{aligned} & \cancel{(x+3)}(x+4) \\ & \underline{x^2 + 7x + 12} \\ & x \cancel{(x+3)} \end{aligned}$$

Practice :

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

$= (4x^2 + 12x)$

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

$3x^2 + x - 3x + 1$

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

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

$$\frac{-3x^2 - 10x}{(x+2)(x+3)} = \frac{x(-3x-10)}{(x+2)(x+3)}$$

$$\frac{3x^2 - 2x - 1 + 10x^2 - 20x}{(x-1)(5x)}$$

$$\frac{13x^2 - 22x - 1}{(x-1)(5x)}$$

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

$$\frac{\overset{3x}{\cancel{3x}} - 4x + 3x - 4}{(x+1)(x)} - \frac{\overset{2x^2}{\cancel{2x(x)}}}{(x+1)(x)}$$

- 2pt
or
- 3pt.

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

How to divide rational functions

Looks Like : $\frac{\frac{1}{2}}{\frac{3}{4}} = \frac{1}{2} \div \frac{3}{4}$

change to multiplication

$\frac{1}{2} \rightarrow \frac{4}{2}$
 $\frac{3}{4} \rightarrow \frac{3}{4}$ (reciprocal)

multiply across

$= \frac{4}{6} = \frac{2}{3}$
 answer

Practice :

$\frac{3/4}{1/5} = \frac{3}{4} \div \frac{1}{5} = \frac{3 \cdot 5}{4 \cdot 1} = \frac{15}{4}$

$\frac{2x/3}{1/2} = \frac{2x}{3} \div \frac{1}{2} = \frac{2x \cdot 2}{3 \cdot 1} = \frac{4x}{3}$

Division

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

$$\frac{1}{2} \div \left(\frac{3}{4}\right)$$

change to multiplication

$$\frac{1}{2} \rightarrow \frac{4}{3}$$

reciprocal

$$\frac{4}{6} = \left(\frac{2}{3}\right)$$

multiply across

$$\frac{\frac{2x}{3}}{\frac{5}{4}} = \frac{2x \cdot 4}{3 \cdot 5} = \frac{8x}{15}$$

How to divide rational functions

$$\frac{\frac{1}{2}}{\frac{3}{4}}$$

$$\frac{1}{2} \div \frac{3}{4}$$

change to multiplication

$$\frac{1}{2} \rightarrow \frac{4}{2} \quad \frac{3}{4} \rightarrow \frac{4}{3}$$

reciprocal

$$= \frac{4}{6} = \frac{2}{3}$$

multiply across

answer

$\frac{2x}{5}$	$\frac{2x}{5} \div \frac{3}{2}$
$\frac{3}{2}$	$\frac{2x}{5} \cdot \frac{2}{3} = \frac{4x}{15}$
$\frac{4x}{2}$	$\frac{4x}{2} \div \frac{3x}{5}$
$\frac{3x}{5}$	$\frac{4x}{2} \cdot \frac{5}{3x} = \frac{20x}{6x} = \frac{20}{6} = \frac{10}{3}$

Subtraction

$$\frac{(3x+1)}{(x+2)} - \frac{(4x-5)}{(x+2)} = \frac{-x-4}{x+2} \quad \text{Find the mistake}$$

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

$$\frac{\frac{x+1}{3}}{\frac{x+1}{8}} = \frac{(x+1)}{3} \cdot \frac{8}{(x+1)} = \frac{8x+8}{3x+3}$$

\downarrow
think
 parenthesis

keep
 going
 ==

$$\frac{\cancel{(x+1)} 8}{3 \cancel{(x+1)}} = \boxed{8/3}$$

$$\frac{(x+1) \frac{3x+2}{x+4}}{(x+1) \frac{2x+5}{x+4}} - \frac{(x+1) \frac{2x^2+13x+20}{x+1}}{(x+1) \frac{2x+5}{x+4}}$$

$$\frac{3x^2+5x+2 - 2x^2-13x-20}{(x+1)(x+4)}$$

$$\frac{x^2-8x-18}{(x+1)(x+4)} \rightarrow \begin{matrix} (x+4)(x) \\ (x+1)(x) \end{matrix}$$

$$\frac{x^2-8x-18}{(x+1)(x+4)}$$

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

ANSWER

$$\frac{(4x+1) \cdot 5}{3 \cdot (x+2)} = \frac{(20x+5)}{(3x+6)}$$

No

$$\frac{(20x+5)}{(3x+6)}$$

$$\frac{\frac{3x+2}{x+1}}{\frac{x+1}{5}} :$$

$$\frac{3x+2}{x+1} \div \frac{x+1}{5}$$

$$\frac{3x+2}{x+1} \cdot \frac{5}{x+1} = \frac{(15x+10)}{(x^2+2x+1)}$$

answer →

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

$$\frac{\frac{4x}{x+1}}{\frac{3x}{x+1}}$$

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

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

$$\frac{4x}{x+1} \div \frac{3x}{x+1}$$

$$\frac{4x}{x+1} \cdot \frac{x+1}{3x}$$

$$\frac{4x \cancel{(x+1)}}{\cancel{(x+1)} 3x}$$

$$\frac{4x}{3x} = \left(\frac{4}{3}\right)$$

$$\frac{\cancel{4x}}{\cancel{(x+1)}} \cdot \frac{\cancel{(x+1)}}{\cancel{3x}}$$

$$\frac{4}{3}$$

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

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

$$\frac{x+2}{3x} \div \frac{2x}{x+1}$$

$$\frac{(x+2)}{3x} \rightarrow \frac{(x+1)}{2x}$$

$$\frac{(x+2)(x+1)}{6x^2}$$

Leave it this way



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

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

$$\frac{3x+1}{2} \div \frac{3x+1}{6}$$

$$\frac{(3x+1)}{2} \cdot \frac{6}{(3x+1)} = \frac{\cancel{(3x+1)} 6}{2 \cancel{(3x+1)}} = \frac{6}{2} = 3$$

$$\frac{x^2+7x+12}{5x}$$

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

$$\frac{x^2+7x+12}{5x} \cdot \frac{1}{x+3}$$

?

$$\frac{x^2+7x+12}{5x(x+3)} = \frac{\cancel{(x+3)}(x+4)}{5x\cancel{(x+3)}}$$

↘

$$\frac{(x+4)}{5x} \text{ answer}$$

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

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

\checkmark GCF
~~Factor?~~

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

$(x+2)(x+2)$
 $x^2 + 4x + 4$

$$\frac{x^2 + 7x + 12}{2}$$

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