

5.4 Multiply and Divide Rational Expressions
5.5 Add and Subtract Rational Expressions



WELCOME BACK
TO SCHOOL

The text is rendered in a playful, bubbly font with thick outlines and a dotted drop shadow. Each letter is filled with a different color: red, yellow, blue, green, and red. The words are arranged in two lines, with 'WELCOME BACK' on top and 'TO SCHOOL' below it.

HW:

Ch 5 Day 1

Quiz: Monday

Stop by before school this week if you want to look at your midterm exam.

ex: True or False?

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

false

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

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

false

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

c) $\frac{\cancel{x}}{\cancel{x}(x+1)} = \frac{1}{x+1}$

true

Rational Expressions

A rational expression has the form $\frac{f(x)}{g(x)}$ where $f(x)$ and $g(x)$ polynomials and $g(x) \neq 0$.

A rational expression is in simplified form when its numerator and denominator have NO common factors.

ex: Simplify.

a) $\frac{(2x^2 + 10x)}{3x^2 + 16x + 5}$

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

ex: Simplify.

$$b) \frac{5x^3 + 20x^2 + 15x}{x^3 - 6x^2 - 9x + 54} = \frac{5x(x^2 + 4x + 3)}{x^2(x-6) - 9(x-6)}$$

$$\frac{5x(\cancel{x+3})(x+1)}{(\cancel{x+3})(x-3)(x-6)}$$

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

ex: Simplify.

$$c) \frac{x^2 - 4}{x^3 - 8}$$

SOAP

$$(x+2)(\cancel{x-2})$$

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

$$\frac{x+2}{x^2+2x+4}$$

$$x^2+2x+4$$

ex: Simplify.

$$d) \frac{2x^2 - 6x - 36}{4x^2 - 16x + 12}$$

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

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

REVIEW: Perform the indicated operation.

$$\text{a) } \frac{1}{2} \cdot \frac{4}{5} = \frac{4}{10} = \frac{2}{5}$$

$$\text{b) } \frac{1}{2} \div \frac{4}{5} = \frac{1}{2} \cdot \frac{5}{4} = \frac{5}{8}$$

$$\text{c) } \frac{1}{2} + \frac{4}{5} = \frac{5 + 8}{10} = \frac{13}{10}$$

$$\text{d) } \frac{1}{2} - \frac{4}{5} = \frac{5 - 8}{10} = -\frac{3}{10}$$

The rules for multiplying, dividing, adding and subtracting fractions are the **SAME** for rational expressions!

ex: Perform the indicated operation. Express your answer in simplest form.

$$\text{a) } \frac{x^2 - 6x - 16}{x^2 - 16x + 24} \cdot \frac{x - 8}{x^2 + 5x + 6}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$b) \frac{x^2 - 5x - 36}{x^2 - 49} \cdot \frac{(x^2 - 11x + 28)}{1}$$

$$\frac{(x-9)(x+4)\cancel{(x-7)}(x-4)}{\cancel{(x-7)}(x+7)}$$

$$\frac{(x-9)(x+4)(x-4)}{x+7}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$c) \frac{8x - 20}{x^2 + 2x - 35} \div \frac{4x^2 - 16}{x^2 - 7x + 10}$$

$$\frac{\cancel{4}(2x-5) \cancel{(x-5)} \cancel{(x-2)}}{\cancel{(x+7)} \cancel{(x-5)} \cancel{4} \cancel{(x+2)} \cancel{(x-2)}}$$
$$\frac{(2x-5)}{(x+7)(x+2)}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$d) \frac{x^3 - 3x^2 - 9x + 27}{3x^2 + 10x + 8} \div \frac{x^2 - 6x + 9}{3x^2 + x - 4}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$e) \frac{\frac{4x}{x+6}}{x^2+3x-18}$$

$$\frac{4x}{x+6} \div \left(\frac{x^2+3x-18}{1} \right)$$

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

$$\frac{4/x}{(x+6)^2(x-3)}$$

REVIEW: Find the LCM.

The least common multiple (LCM) of two numbers or expressions is the smallest quantity (not zero) that is a divisible by both numbers or expressions.

a) 5, 2

10

b) 3, 12

12

REVIEW: Find the LCM.

c) 8, 12

$$\cancel{2 \cdot 2 \cdot 2}$$

$$\cancel{2 \cdot 2} \cdot 3$$

$$\frac{2 \cdot 2 \cdot 2 \cdot 3}{\text{share}} = 24$$

not shared

d) 24, 30

$$24: \cancel{2 \cdot 2 \cdot 2 \cdot 3}$$

$$30: \cancel{2 \cdot 3 \cdot 5}$$

$$2 \cdot 3 \cdot 2 \cdot 2 \cdot 5$$

120

e) 35, 50

$$\cancel{35: 5 \cdot 7}$$

$$50: \cancel{5} \cdot 5 \cdot 2$$

$$5 \cdot 7 \cdot 5 \cdot 2$$

350

REVIEW: Find the LCM.

f) $x^3 - x^2 - 2x$, $x^2 - 4x + 4$

$$x(x-2)(x+1) ; (x-2)(x-2)$$

$$(x-2)x(x+1)(x-2) \text{ or}$$

$$x(x-2)^2(x+1)$$

LCM

$$\begin{array}{l|l} 4(x-5)(x+1) & 6(x+1)(x-1) \\ \hline \cancel{2} \cdot 2(x-5)(\cancel{x+1}) & \cancel{2} \cdot 3(\cancel{x+1})(x-1) \end{array}$$

$$2(x+1) \cdot 2(x-5)(3)(x-1)$$
$$12(x+1)(x-5)(x-1)$$

REVIEW: Find the LCM.

g) $x^2 - 10x + 25$, $5x^2 - 24x - 5$

$$(x-5)(\cancel{x-5}) \quad (5x+1)(\cancel{x-5})$$

$$(x-5)(x-5)(5x+1)$$

$$\text{OR}$$
$$(x-5)^2(5x+1)$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$a) \frac{5(2x-1)}{6x-18} - \frac{x-1}{4x^2-14x+6}$$

$$6(x-3) \cdot 2(2x-1)(x-3)$$

LCM

$$6x-18: 6(x-3)$$

$$4x^2-14x+6: 2(2x-1)(x-3)$$

$$6(x-3)(2x-1)$$

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

$$\frac{7x-2}{6(x-3)(2x-1)}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$\text{b) } \frac{5x+1}{3x^2+3} + \frac{7x}{x+1}$$

$3(x^2+1)$

$$3x^2+3 : 3(x^2+1)$$
$$: x+1$$

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

$$\frac{5x^2+6x+1 + 21x^3+21x}{3(x^2+1)(x+1)} = \frac{21x^3+5x^2+27x+1}{3(x^2+1)(x+1)}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$\begin{aligned} \text{c) } 6 - \frac{x+5}{x^2-2} &= \frac{6}{1} - \frac{(x+5)}{(x^2-2)} \\ &= \frac{6(x^2-2) - (x+5)}{x^2-2} \\ &= \frac{6x^2 - 12 - x - 5}{x^2-2} \\ &= \frac{6x^2 - x - 17}{x^2-2} \end{aligned}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$d) \frac{x}{x-2} - \frac{x}{5} \div \frac{x^3 - 4x}{15x + 5}$$

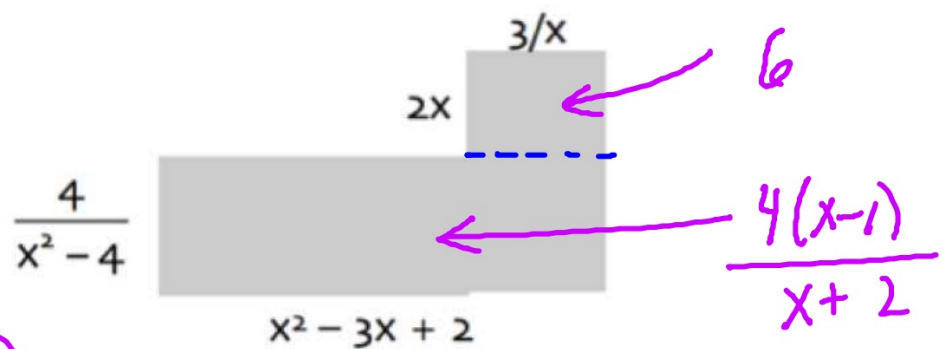
ex: Perform the indicated operation. Express your answer in simplest form.

$$e) \left(\frac{\cancel{5}x^3y \cdot \cancel{21}x}{\cancel{35} \cdot \cancel{15}y^2} \right) \div \frac{25x}{9y}$$

$$\frac{x^4y}{5y^2}$$

$$\left(\frac{x^4}{5y} \right) \cdot \frac{\cancel{9y}}{\cancel{25}x} = \frac{9x^3}{125}$$

ex: Find the area.



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

$$\frac{6(x+2) + 4(x-1)}{x+2} = \frac{10x+8}{x+2}$$