

6.2: Multiplication and Division of Rational Expressions (cont'd.)

Note Title

4/14/2015

Ex: Multiply.

$$\begin{aligned} \frac{(x+2)}{4x^2-16} \cdot \frac{5}{1} &= \frac{x+2}{1} \cdot \frac{5}{4(x^2-4)} \\ &= \frac{\cancel{x+2}}{1} \cdot \frac{5}{4(\cancel{x+2})(x-2)} \\ &= \boxed{\frac{5}{4(x-2)}} \end{aligned}$$

Ex: Simplify.

$$\begin{aligned} \frac{x^2 y^2 z^2}{y z^3} \div \frac{x y^4}{x y^2 z} &= \frac{x^2 y^2 z^2}{y z^3} \cdot \frac{x y^2 z}{x y^4} \\ &= \frac{x^3 y^4 z^3}{x y^5 z^3} = \boxed{\frac{x^2}{y}} \end{aligned}$$

Ex: Simplify.

$$\begin{aligned} & \frac{8x^2 - 16x + 32}{2x^4 + 16x} \div \frac{4x^2 - 4x - 8}{x^3 - 4x} \\ &= \frac{8x^2 - 16x + 32}{2x^4 + 16x} \cdot \frac{x^3 - 4x}{4x^2 - 4x - 8} = \frac{8(x^2 - 2x + 4)}{2x(x^3 + 8)} \cdot \frac{x(x^2 - 4)}{4(x^2 - x - 2)} \\ &= \frac{8(x^2 - 2x + 4)}{2x(x+2)(x^2 - 2x + 4)} \cdot \frac{x(x+2)(x-2)}{4(x+1)(x-2)} = \frac{8x}{8x(x+1)} = \boxed{\frac{1}{x+1}} \end{aligned}$$

Ex: Simplify.

$$\begin{aligned} & \frac{x^2 + 7x + 12}{x^2 - 4x} \div (x^2 - 9) = \frac{x^2 + 7x + 12}{x^2 - 4x} \div \frac{x^2 - 9}{1} \\ &= \frac{x^2 + 7x + 12}{x^2 - 4x} \cdot \frac{1}{x^2 - 9} = \frac{(x+3)(x+4)}{x(x-4)} \cdot \frac{1}{(x+3)(x-3)} \\ &= \boxed{\frac{x+4}{x(x-4)(x-3)}} \end{aligned}$$

6.3: Addition and Subtraction of Rational Expressions

Add to Homework List:

23, 27, 31, 29, 33, 35, 37, 39

Ex: Multiplication: $\frac{3}{5} \cdot \frac{4}{5} = \boxed{\frac{12}{25}}$

Addition: $\frac{3}{5} + \frac{4}{5} = \frac{3+4}{5} = \boxed{\frac{7}{5}}$

Addition with different denominators: $\frac{3}{5} + \frac{4}{7}$

Least Common Denominator (LCD): 35

$$= \frac{3}{5} \left(\frac{7}{7} \right) + \frac{4}{7} \left(\frac{5}{5} \right)$$

$$= \frac{21}{35} + \frac{20}{35} = \boxed{\frac{41}{35}}$$

Example: Simplify.

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

Ex: $\frac{3}{x+5} - \frac{10}{x+5} = \frac{3-10}{x+5} = \boxed{\frac{-7}{x+5}} = \boxed{-\frac{7}{x+5}}$

Ex: $\frac{4x}{x+1} + \frac{x+3}{x+1} = \frac{4x+x+3}{x+1} = \boxed{\frac{5x+3}{x+1}}$

Ex: $\frac{3y-5}{y+4} - \frac{5y-7}{y+4}$

$$= \frac{3y-5}{y+4} - \frac{(5y-7)}{y+4} = \frac{3y-5}{y+4} + \frac{-5y+7}{y+4}$$

$$= \frac{3y-5-5y+7}{y+4} = \boxed{\frac{-2y+2}{y+4}} = \boxed{\frac{-2(y-1)}{y+4}} = \boxed{-\frac{2(y-1)}{y+4}}$$

Also correct: $-\frac{2y-2}{y+4}, \frac{2y-2}{-y-4}$

Not correct: $-\frac{2y+2}{y+4}$

Ex: $\frac{2x+1}{x^2-1} + \frac{x+2}{x^2-1} = \frac{2x+1+x+2}{x^2-1}$

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

Examples that do not already have a common denominator:

Ex: $\frac{2}{1-x} + \frac{6}{x-1}$ (do not have a common denominator)

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

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

Ex: $\frac{7x}{30} - \frac{11x}{12}$

Least Common Denominator (LCD): 60

$$= \frac{7x}{30} \left(\frac{2}{2} \right) + \frac{-11x}{12} \left(\frac{5}{5} \right)$$

$$= \frac{14x}{60} + \frac{-55x}{60} = \frac{14x-55x}{60} = \boxed{\frac{-41x}{60}} = \boxed{-\frac{41x}{60}}$$

Ex: $\frac{5y}{6x^2} - \frac{y}{4x}$

LCD: $12x^2$

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

$$= \frac{10y}{12x^2} + \frac{-3xy}{12x^2} = \boxed{\frac{10y-3xy}{12x^2}} = \boxed{\frac{y(10-3x)}{12x^2}}$$

Ex: $\frac{5}{x} - \frac{x+4}{x-2}$

LCD: $x(x-2)$

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

$= \frac{5x-10 - x(x+4)}{x(x-2)} = \frac{5x-10-x^2-4x}{x(x-2)}$

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