Intro to Rational Expressions

Fractions and Exponents Review

Fractions Review

Adding and Subtracting Fractions

Always find a common denominator when adding or subtracting fractions!

a) $\frac{1}{2}\overset{\times 4}{} + \frac{1}{8}$

$= \frac{4}{8} + \frac{1}{8}$

$= \frac{5}{8}$ (keep denominator)

b) $\frac{2x}{3y}\overset{\times 2}{} - \frac{y}{2}\overset{\times 3y}{}$

common denom $= 3y(2)$
$= 6y$

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

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

Multiplying and Dividing Fractions

You do NOT need a common denominator when multiplying or dividing fractions!

a) $\frac{3}{2} \cdot \frac{4}{5}$

$= \frac{(3)(4)}{(2)(5)}$

$= \frac{12}{10}$

$= \frac{6}{5}$

b) $\frac{2}{3} \div \frac{4}{3}$

Flip second fraction and * multiply

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

$= \frac{6}{12}$

$= \frac{1}{2}$

Rule: We can NEVER have a fraction with a denominator of 0. Why?

eg. $\frac{6}{2} = 3$

why? because $2 \times 3 = 6$

$\frac{6}{0} = ?$

This means $0 \times \frac{?}{} = 6$

Rule: Cross multiplication of fractions only happens when..... There is an = sign between two fractions.

eg. $\frac{2}{3} = \frac{x}{5}$

$5(2) = 3x$

$10 = 3x$

$x = \frac{10}{3}$

Rule: We can cancel out ONLY when multiplying fractions

You can cancel factors.

eg. $\frac{x(x+1)}{x} = x+1$

eg. $\frac{3x(x+3)}{2x} = \frac{3x+9}{2}$

These are examples of when cancelling is allowed.

Rule: We can NOT cancel out when adding or subtracting fractions

e.g. $\frac{x+8}{x}$ NO! Don't do this!

e.g. $\frac{2x+3}{4x}$ ← No cancelling!

Name	Rule	Examples
Adding and Subtracting Monomials	COMBINE LIKE TERMS! (do not change common variables and exponents)	$3x^2y + 2x^2y =$ $5x^2y$
Product Rule	$x^a \cdot x^b =$ x^{a+b}	$(-2x^2y)(3x^3y^2) =$ $-6x^5y^3$
Quotient Rule	$\frac{x^a}{x^b} =$ x^{a-b}	$\frac{28x^5}{42x} =$ $\frac{2x^4}{3}$
Power of a Power Rule	$(x^a)^b =$ $x^{a \times b}$	$(-2x^3)^2 =$ $4x^6$
Negative Exponent Rule	$x^{-a} =$ $\frac{1}{x^a}$	$\frac{4x^2}{8x^5} =$ $\frac{1}{2x^3}$
Exponent of Zero	$x^0 = 1$	$87^0 =$ 1

Simplify the following rational expressions using exponent laws

a) $\dfrac{12k^2m^8}{4k^5m^5}$ $= 3k^{-3}m^3$

$= \dfrac{3m^3}{k^3}$

b)

$$\frac{5c^3d \cdot 4c^2d^2}{(2c^2d)^2} = \frac{20c^5d^3}{4c^4d^2}$$

$$= 5cd$$

c)

$$\frac{(3xy)^3}{9x^4y^4} = \frac{27x^3y^3}{9x^4y^4}$$

$$= 3x^{-1}y^{-1}$$

$$= \frac{3}{xy}$$

d)

$$\frac{(2z^3)^{-2}}{w^5 z^2} = \frac{2^{-2} z^{-6}}{w^5 z^2}$$

$$= \frac{1}{2^2 w^5 z^2 z^6}$$

$$= \frac{1}{4w^5 z^8}$$

e)

$$\frac{(x^{-4})^5 x^3}{3x^{-1}} = \frac{x^{-20} x^3}{3x^{-1}}$$

$$= \frac{x^{-17}}{3x^{-1}}$$

$$= \frac{1}{3x^{-1} x^{17}}$$

$$= \frac{1}{3x^{16}}$$

Combining fractions and exponents:

ex. $\frac{3x^{1}}{2x^{2}} + \frac{4y^{3}}{3y}$

$= \frac{3x^{x3}}{2^{x3}} + \frac{4y^{3\,x2}}{3^{x2}}$

$= \frac{9x}{6} + \frac{8y^3}{6}$

$= \frac{9x+8y^3}{6}$

COMPLETE WORKSHEET