7.3 - Multiplying and Dividing Rational Expressions

Warmup

1. $\dfrac{7x^2}{9y} \div \dfrac{4x}{15y^2} \cdot \left(\dfrac{35}{6xy}\right)^{-1}$

$\dfrac{x^2y^2}{2}$

2. $\dfrac{x(x-1)}{(x-2)^2} \div \dfrac{(x-1)^2}{x-2}$

$\dfrac{x}{(x-2)(x-1)}$

3. $\dfrac{t-2}{t+3} \cdot \dfrac{t^2+2t-3}{t^2-t-2}$

$\dfrac{t-1}{t+1}$

4. $\dfrac{4u^2-1}{u^2-4} \cdot \dfrac{u-2}{2u-1}$

$\dfrac{2u+1}{u+2}$

5. $\dfrac{x^2}{x-1} \cdot \dfrac{x+1}{x+2} \div \dfrac{x}{(x-1)(x+2)}$

$x(x+1)$

6. $\dfrac{\frac{p^4-q^4}{(p+q)^2}}{p^2+q^2}$

$\dfrac{p-q}{p+q}$

7.4 - Adding and Subtracting Rational Expressions

$$\frac{1}{34} + \frac{1}{170} = \frac{1}{2(17)} + \frac{1}{2(5)(17)} = \frac{5}{2(17) \cdot 5} + \frac{1}{2(5)(17)} = \frac{6}{170}$$

$$\frac{5}{12} + \frac{7}{32} + \frac{1}{9} = \frac{215}{288}$$

7.4 - Adding and Subtracting Rational Expressions

LCD $24a^2b^2$

$$\frac{1}{6a^2} - \frac{1}{2ab} + \frac{3}{8b^2} = \frac{1 \cdot 4b^2}{6a^2 \cdot 4b^2} - \frac{1 \cdot 12ab}{2ab \cdot 12ab} + \frac{3 \cdot 3a^2}{8b^2 \cdot 3a^2}$$

$$= \frac{4b^2 - 12ab + 9a^2}{24a^2b^2}$$

$$= \frac{(2b - 3a)(2b - 3a)}{24a^2b^2}$$

Practice

1. $\dfrac{7x}{15y^2} + \dfrac{y}{18xy}$

$\dfrac{42x^2 + 5y^2}{90xy^2}$

2. $\dfrac{1}{2xy} + \dfrac{1}{6y^2} - \dfrac{2}{8x^2y}$

$\dfrac{2x^2 + 6xy - 3y}{12x^2y^2}$

7.4 - Adding and Subtracting Rational Expressions

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

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

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

Practice

1. $\dfrac{3}{x^2 + x - 6} - \dfrac{2}{x^2 - 3x + 2}$

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

2. $\dfrac{1}{2u^2 - 3uv + v^2} + \dfrac{1}{4u^2 - v^2}$

$$\frac{3u}{(2u + v)(2u - v)(u - v)}$$

Old

$$\frac{\dfrac{x^2 - 3x - 4}{x^2 - 1}}{\dfrac{x^2 - 2x - 8}{x^2 - 2x + 1}} = \frac{x^2 - 3x - 4}{x^2 - 1} \div \frac{x^2 - 2x - 8}{x^2 - 2x + 1}$$

$$= \frac{x^2 - 3x - 4}{x^2 - 1} \cdot \frac{x^2 - 2x + 1}{x^2 - 2x - 8}$$

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

7.4 - Adding and Subtracting Rational Expressions

New

$$\frac{z - \dfrac{1}{z}}{1 - \dfrac{1}{z}} = \frac{\dfrac{z^2}{z} - \dfrac{1}{z}}{\dfrac{z}{z} - \dfrac{1}{z}} = \frac{\dfrac{z^2 - 1}{z}}{\dfrac{z - 1}{z}} = \frac{z^2 - 1}{z} \cdot \frac{z}{z - 1}$$

$$= \frac{z(z + 1)(z - 1)}{z(z - 1)} = z + 1$$

Practice

1. $\dfrac{\dfrac{1}{a} - \dfrac{1}{x}}{\dfrac{1}{a^2} - \dfrac{1}{x^2}}$

$\dfrac{ax}{a + x}$

2. $\dfrac{1 + \dfrac{3}{x} + \dfrac{2}{x^2}}{1 + \dfrac{2}{x}}$

$\dfrac{x + 1}{x}$