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

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

$$=\frac{3}{85}$$

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

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

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

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

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

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

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

7.4 - Adding and Subtracting Rational Expressions

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

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

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

Practice

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

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