

Multiply

- Factor everything possible
- Write excluded values
- Cancel out common factors
- Write as one fraction

Example: $\frac{x^2-2x-3}{x^2-4} \cdot \frac{x^2+7x+10}{6x-18} = \frac{\cancel{(x-3)}(x+1)}{(x-2)\cancel{(x+2)}} \cdot \frac{(x+5)\cancel{(x+2)}}{6\cancel{(x-3)}}$

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

Divide

- Factor everything possible
- Keep first fraction. Change to multiplication. Reverse second fraction.
- Write excluded values
- Cancel out common factors
- Write as one fraction

Example: $\frac{x^2-2x-8}{3x-3} \div \frac{x^2-x-12}{x-4} = \frac{(x-4)(x+2)}{3(x-1)} \div \frac{(x-4)(x+3)}{x-4}$

$$= \frac{\cancel{(x-4)}(x+2)}{3(x-1)} \cdot \frac{x-4}{\cancel{(x-4)}(x+3)}$$

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

Operations with Rational Expressions

Add

- Factor everything possible
- Get common denominators
- Write excluded values
- Add numerators only – distribute when necessary, then combine like terms
- Write as one fraction over the LCD

Example: $\frac{x-4}{2} + \frac{3x}{2} = \frac{2(x-4)}{2x} + \frac{3x^2}{2x}$

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

$$= \frac{2x-8+3x^2}{2x} \quad \text{OR} \quad \frac{(3x-4)(x+2)}{2x}$$

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

Subtract

- Factor everything possible
- Get common denominators
- Write excluded values
- Subtract numerators only – use parenthesis to subtract, distribute when necessary, then combine like terms
- Write as one fraction over the LCD

Example: $\frac{4}{x+2} - \frac{7x}{6x^2+3x} = \frac{4 \cdot 3x(2x+1)}{x+2 \cdot 3x(2x+1)} - \frac{7x(x+2)}{3x(x+2)(2x+1)}$

$$= \frac{12x(2x+1)}{3x(x+2)(2x+1)} - \frac{7x(x+2)}{3x(x+2)(2x+1)}$$

$$= \frac{24x^2+12x - 7x^2 - 14x}{3x(x+2)(2x+1)}$$

$$= \frac{17x^2-2x}{3x(x+2)(2x+1)} = \frac{\cancel{x}(17x-2)}{\cancel{3x}(x+2)(2x+1)}$$

$$= \frac{17x-2}{3(x+2)(2x+1)}$$

****You can only cancel when multiplying****