

Simplifying Rational Expressions

Steps:

1. Factor numerator
2. Factor denominator
3. Cancel common factors in numerator + denominator

Example: Simplify $\frac{x^2+4x-12}{x^2-4}$

How to do it...

$$\frac{(x+6)(\cancel{x-2})}{(x+2)(\cancel{x-2})}$$

$$\frac{(x+6)}{(x+2)}$$

$$\begin{array}{r} x^2+4x-12 \\ \underline{-12} \\ 6x-2 \\ \underline{-4} \\ 6x-4 \end{array}$$

$$\begin{array}{l} x^2-4 \\ \text{Dif. of Sq.} \\ (x+2)(x-2) \end{array}$$

How NOT to do it...

$$\frac{\cancel{x}^3+4x-\cancel{12}}{\cancel{x}^2-4}$$

WRONG!

You can't
cancel
terms!

Reminders:

We can only cancel like factors, not terms!

Factors are being **multiplied** together. Terms are added or subtracted.

Factors cancel when they are the same in the numerator and the denominator.

Examples:

$$1. \frac{p-2}{5p^2-7p-6} \rightarrow (5p^2-10p+3p-6)$$
$$\frac{(p-2)}{(5p+3)(p-2)}$$

~~$\frac{30}{-10 \cdot 3}$~~

$$\frac{1}{5p+3}$$

$$2. \frac{v^2+3v+2}{v^2-5v-6}$$

$$\frac{(v+2)(v+1)}{(v-6)(v+1)}$$

$$\frac{v+2}{v-6}$$

$$3. \frac{x^2-25}{x^2-2x-15} \leftarrow \text{Diff. of Squares}$$

$$\frac{(x+5)(x-5)}{(x-5)(x+3)}$$

$$\frac{(x+5)}{(x+3)}$$

$$\frac{-15}{-5 \cdot 3}$$
$$\frac{-2}{-2}$$

$$4. \frac{x^2-6x}{x^2-7x+6} \leftarrow \text{GCF}$$

$$\frac{x(x-6)}{(x-6)(x-1)}$$

$$\frac{x}{(x-1)}$$

$$\frac{-6}{-6 \cdot -1}$$
$$\frac{-1}{-1}$$

$$5. \frac{9x^2}{27x^4}$$

$$\frac{3 \cdot 3 \cdot x \cdot x}{3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x \cdot x}$$

$$= \frac{1}{3x^2}$$

or $\frac{9x^2}{27x^4}$

reduce $\frac{1}{3x^2}$