1.5 RATIONAL EXPRESSION involving polynomials.

(fractional)

- Look for common factors in both numerator & denominator
- Cancel out the factors that simplify to one.

Examples

1. \[ \frac{15x^2}{10x} = \frac{3 \cdot 5 \cdot x \cdot x}{2 \cdot 5 \cdot x} = \frac{3x}{2} \]

2. \[ \frac{18y^2}{60y^3} = \frac{2 \cdot 3 \cdot 3 \cdot y \cdot y}{2 \cdot 2 \cdot 3 \cdot 5 \cdot y \cdot y} = \frac{3}{10y} \]

3. \[ \frac{2x^2y}{xy-y} = \frac{2 \cdot x \cdot x \cdot y}{(x-1) \cdot y} = \frac{2x^2}{x-1} \]

4. \[ \frac{9x^2+9x}{2x+2} = \frac{9x(x+1)}{2(x+1)} = \frac{9x}{2} \]

5. \[ \frac{x-5}{10-2x} = \frac{x-5}{2(5-x)} = \frac{-1}{2} \text{ or } \frac{-1}{-2} = \frac{1}{2} \]

\( x-5 \) and \( 5-x \) are not the same, but they are opposites of each other, \( (x-5)+(5-x)=0 \).

A number divided by its opposite equals \(-1\).

So I can cancel opposites if I leave behind a factor of \(-1\).

6. \[ \frac{12-4x}{x-3} = \frac{4(3-x)}{x-3} = -4. \]

If you're not certain if something are opposites, pick a number and substitute...
(7) \[ \frac{y^2 - 16}{y + 4} = \frac{(y + 4)(y - 4)}{(y + 4)} = y - 4. \]

(8) \[ \frac{x^2 + 8x - 20}{x^2 + 11x + 10} = \frac{(x + 5)(x - 2)}{(x + 1)(x + 1)} = \frac{x - 2}{x + 1} \]

"You can only cancel factors. Factor are things that multiply. You cannot cancel terms. Terms are things that are added or subtracted."

(9) \[ \frac{x^2 + 2x - 15}{x^2 - 9} = \frac{(x + 5)(x - 3)}{(x + 3)(x - 3)} = \frac{x + 5}{x + 3} \]

(10) \[ \frac{x^2 + 10x + 24}{x^2 - 16} = \frac{(x + 4)(x + 6)}{(x + 4)(x - 4)} = \frac{x + 6}{x - 4} \]

(11) \[ \frac{25 - x^2}{x^2 + 12x + 35} = \frac{(5 + x)(5 - x)}{(x + 5)(x + 7)} = \frac{(5 + x)(5 - x)}{(x + 5)(x + 7)} = \frac{5 - x}{x + 7} \]

(12) \[ \frac{x^2 + 5x + 50}{x^2 + 3x - 70} = \frac{(x + 10)(x + 5)}{(x + 10)(x - 7)} = \frac{x + 5}{x - 7} \]