Simplifying Rational Expressions

Rational Expression - a "fraction" with a polynomial in the numerator and in the denominator

Examples:

$$\frac{2x}{x+1} \qquad \frac{3}{a+1} \qquad \frac{2a^2+5}{4a+1}$$

To simplify rational expressions, we need to fully factor both the numerator and the denominator first!

Simplify the following rational expressions and state any RESTRICTIONS on the variable:

Reduce

FACTOR FIRST

1) $$\frac{12a^3-6a^2-18a^4}{5a^2}$$

$$= \frac{6a^2(2a-1-3a^2)}{5a^2}$$

$$= \frac{6 \times a^2 \times (2a-1-3a^2)}{5 \times a^2}$$

$$= \frac{6(2a-1-3a^2)}{5}$$

$a \neq 0$

2) $\dfrac{a}{3a^2 - 9a}$

FACTOR FIRST

$= \dfrac{\cancel{a}\,1}{3\cancel{a}(a-3)}$ ✗

$= \dfrac{1}{3(a-3)}$

$a \neq 0$
$a \neq 3$

3) $\dfrac{5-2k}{8k-20}$

★ FACTOR FIRST

$= \dfrac{-1(5-2k)}{4(2k-5)}$

$= \dfrac{-1\cancel{(2k-5)}}{4\cancel{(2k-5)}}$

$= \dfrac{-1}{4}$

$K \neq 2.5$ or $K \neq 5/2$

Aside
$2K - 5 = 0$
$2k = 5$
$K = 5/2$

4) $\dfrac{x^2+3xy-10y^2}{x^2+8xy+15y^2}$

FACTOR FIRST:

$= \dfrac{(x+5y)(x-2y)}{(x+5y)(x+3y)}$

$x \neq -5y$
$x \neq -3y$

$= \dfrac{(x-2y)}{(x+3y)}$

Aside

$x+5y=0 \quad x+3y=0$
$x=-5y \quad x=-3y$
$y=-\frac{x}{5}$

5) $\dfrac{m^2-4}{3m^2+2m-8}$

FACTOR FIRST

$= \dfrac{(m-2)(m+2)}{(3m-4)(m+2)}$

$m \neq -2$
$m \neq \frac{4}{3}$

$= \dfrac{(m-2)}{(3m-4)}$

$3m-4=0$
$3m=4$
$m=4/3$