2.4 Simplifying Rational Expressions

Rational Number: a ratio of two integers a and b written as $\frac{a}{b}$ where $b \neq 0$.

Expression: $3x^2 - 4x + 5$

Rational Expression: simply put, a ratio of expressions where the denominator cannot equal zero.

Note: all rules that apply to rational numbers then apply to rational expressions, such as all the fraction rules.

Finding the Restrictions

↳ are values/numbers which would cause the denominator to equal zero.

$$\frac{2x-3}{x+5}$$

$x \neq -5$

1) $\frac{6n}{21n^2}$

$= \frac{2}{7n}$ $\quad n \neq 0$

$\frac{8}{10}$

$= \frac{2(4)}{2(5)}$

$= \frac{4}{5}$

① Factor Fully

2) $\dfrac{9x^2 + 27x}{x + 3}$

$x \neq -3$

$= \dfrac{9x(x+3)}{(x+3)}$

$= 9x \qquad x \neq -3$

$\dfrac{x+3}{9x(x+3)}$ $\quad \dfrac{1}{1}$

$= \dfrac{1}{9x}$

3) $\dfrac{n^2 + 10n + 16}{n^2 + 5n - 24}$

$= \dfrac{(n+8)(n+2)}{(n+8)(n-3)}$

Find restrictions from fully factored form

$= \dfrac{n+2}{n-3}$ $\quad n \neq -8, 3$

4) $\dfrac{a^2 - 13a + 36}{2a^3 - 22a^2 + 36a}$

$= \dfrac{(a-9)(a-4)}{2a(a^2 - 11a + 18)}$

$= \dfrac{(a-9)(a-4)}{2a(a-9)(a-2)} = \dfrac{a-4}{2a(a-2)}$

(1) (2) (3)

$a \neq 0, 2, 9$

A trick and a big mistake:

Trick:

$$\frac{3-x}{x-3} \Rightarrow \frac{-x+3}{x-3} \Rightarrow \frac{-(x-3)}{x-3} = -1, \quad x \neq 3$$

Big mistake!

$$\frac{x^2+9x-8}{x^2+3x+2}$$

$$\frac{24}{10} = \frac{2+22}{2+8} = \frac{22}{8}$$

$$= \frac{2(12)}{2(5)} = \frac{12}{5}$$