

8.4 RATIONAL EXPRESSIONS

RECALL: $\frac{6}{16} = \frac{\cancel{2} \cdot 3}{\cancel{2} \cdot 8} = \frac{3}{8}$

ALSO RECALL

$$\frac{-27x^3y}{9x^4y} = \frac{-3}{x}$$

TO SIMPLIFY A RATIONAL EXPRESSION

① COMPLETELY FACTOR BOTH THE NUMERATOR AND DENOMINATOR

② CANCEL COMMON FACTORS

Ex: $\frac{2x^3 - 6x}{6x^2} = \frac{2x(x^2 - 3)}{6x^2} = \frac{x^2 - 3}{3x}$

Ex: $\frac{x^2 + 2x - 15}{4x - 12} = \frac{(x+5)(x-3)}{4(x-3)} = \frac{x+5}{4}$

$$x \neq 3$$

ADJUST THE DOMAIN

$$\text{Ex: } \frac{x^3 - 16x}{x^2 - 2x - 8} = \frac{x(x^2 - 16)}{(x-4)(x+2)}$$

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

$$x \neq 4$$

$$\text{Ex: } \frac{2x^2 - 9x + 4}{12 + x - x^2} = \frac{(2x-1)(x-4)}{(4-x)(3+x)}$$

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

$$x \neq 4$$

To Divide, Multiply by Reciprocal

$$\text{Ex: } \frac{x^2 + 5x + 4}{x^2 - 49} \div \frac{2x^2 + 5x - 12}{x^2 + 5x + 14}$$

$$\frac{x^2 + 5x + 4}{x^2 - 49} \cdot \frac{x^2 + 5x + 14}{2x^2 + 5x - 12}$$

$$\frac{\cancel{(x+4)}(x+1)}{\cancel{(x-7)}(x+7)} \cdot \frac{\cancel{(x+7)}(x+2)}{\cancel{(x+4)}(2x-3)} = \frac{(x+1)(x+2)}{(x-7)(2x-3)}$$

$$x \neq -7, -4, -2$$