Name: **KEY**   Hour: _____   Date: _____

NOTES: Section 8.4 – Multiply and Divide Rational Expressions

Goals: #1 - I can simplify rational expressions.

#2 - I can multiply rational expressions.

#3 - I can divide rational expressions.

Homework: Lesson 8.4 Worksheet

Notes:

A **rational** expression is in **simplest form** if its numerator and denominator have no common factors (other than 1).

To **simplify** rational expressions, first **factor** the numerator and **factor** the denominator. Then **cancel** out any common factors.

Example #1: Simplify the expression.

1. $\dfrac{x^2 - 2x - 15}{x^2 - 9}$

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

$$\boxed{\dfrac{x-5}{x-3}}$$

2. $\dfrac{4x^3}{8x^4 - 16x^2}$

$$\frac{2 \cdot 2 \cdot x \cdot x \cdot x}{8x^2(x^2 - 2)}$$

$$\frac{2 \cdot 2 \cdot x \cdot x \cdot x}{2 \cdot 2 \cdot 2 \cdot x \cdot x \,(x^2 - 2)}$$

$$\boxed{\dfrac{x}{2(x^2 - 2)}}$$

You practice: Simplify the expression.

1. $\dfrac{x+4}{x^2 - 16}$

$$\frac{(x+4)}{(x+4)(x-4)}$$

$$\boxed{\dfrac{1}{x-4}}$$

$3x^2 + 16x + 5$

$\overset{15}{\wedge}$ $15 + 1 = 16$

$3x^2 + 15x + 1x + 5$

$3x(x+5) + 1(x+5)$

$(x+5)(3x+1)$

2. $\dfrac{2x^2 + 10x}{3x^2 + 16x + 5}$

$$\frac{2x(x+5)}{(x+5)(3x+1)}$$

$$\boxed{\dfrac{2x}{3x+1}}$$

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Notes:

To __Multiply__ rational expressions, first __factor__ each numerator and denominator. Then, multiply __numerators__ and multiply __denominators__ and __Simplify__.

Example #2: Multiply the expressions. Simplify the result.

1. $\dfrac{3x - 3x^2}{x^2 + 4x - 5} \cdot \dfrac{x^2 + x - 20}{3x}$

$$\dfrac{3x(1-x)}{(x+5)(x-1)} \cdot \dfrac{(x+5)(x-4)}{3 \cdot x}$$

$$\dfrac{3 \cdot x \cdot (1-x)(x+5)(x-4)}{3 \cdot x \cdot (x+5)(x-1)}$$

$$\dfrac{-1(x-1)(x-4)}{(x-1)}$$

$$\boxed{-(x-4)}$$

2. $\dfrac{x+2}{x^3 - 27} \cdot (x^2 + 3x + 9)$

$$\dfrac{(x+2)}{(x-3)(x^2+3x+9)} \cdot \dfrac{(x^2+3x+9)}{1}$$

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

$$\boxed{\dfrac{x+2}{x-3}}$$

You practice: Multiply the expressions. Simplify the result.

1. $\dfrac{2x^2 - 10x}{x^2 - 25} \cdot \dfrac{x+3}{2x^2}$

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

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

$$\boxed{\dfrac{x+3}{x(x+5)}}$$

2. $\dfrac{6x^2 - 18x}{x^2 + x - 6} \cdot \dfrac{x^2 - x - 2}{x^2 - 7x - 8}$

$$\dfrac{6x(x-3)}{(x+3)(x-2)} \cdot \dfrac{(x-2)(x+1)}{(x-8)(x+1)}$$

$$\dfrac{3 \cdot 2 \cdot x \cdot (x-3)(x-2)(x+1)}{(x+3)(x-2)(x-8)(x+1)}$$

$$\boxed{\dfrac{6x(x-3)}{(x+3)(x-8)}}$$

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Notes:

To __divide__ rational expressions, change it to a __multiplication__ problem. Multiply by the __reciprocal__ of the second rational expression. __Factor__ each numerator and denominator. Then, multiply __numerators__ and multiply __denominators__ and __simplify__.

Example #3: Divide the expressions. Simplify the result.

1. $\dfrac{7x}{2x-10} \div \dfrac{x^2-6x}{x^2-11x+30}$

$$\frac{7x}{2(x-5)} \cdot \frac{(x-5)(x-6)}{x(x-6)}$$

$$\frac{7 \cdot x \cdot (x-5) \cdot (x-6)}{2 \cdot x \cdot (x-5) \cdot (x-6)}$$

$$\boxed{\frac{7}{2}}$$

2. $\dfrac{4x}{5x-20} \div \dfrac{x^2-2x}{x^2-6x+8}$

$$\frac{4x}{5(x-4)} \cdot \frac{(x-4)(x-2)}{x(x-2)}$$

$$\frac{2 \cdot 2 \cdot x \cdot (x-4)(x-2)}{5 \cdot x \cdot (x-4)(x-2)}$$

$$\boxed{\frac{4}{5}}$$

You practice: Divide the expressions. Simplify the result.

1. $\dfrac{3}{x+7} \div \dfrac{8x^2-8x}{x^2+6x-7}$

$$\frac{3}{x+7} \cdot \frac{(x+7)(x-1)}{8x(x-1)}$$

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

$$\boxed{\frac{3}{8x}}$$

2. $\dfrac{2x^2+3x-5}{6x} \div (2x^2+5x)$

$$\overset{-10}{\underset{5 \quad -2 \cdot 3}{\wedge}}$$

$$2x^2 + 5x - 2x - 5$$
$$x(2x+5) - 1(2x+5)$$
$$(2x+5)(x-1)$$

$$\frac{(2x+5)(x-1)}{3 \cdot 2 \cdot x} \cdot \frac{1}{x(2x+5)}$$

$$\frac{(2x+5)(x-1)}{3 \cdot 2 \cdot x \cdot x (2x+5)}$$

$$\boxed{\frac{x-1}{6x^2}}$$