Name: KEY Hour: _____ Date: _____

NOTES: Section 11.3 – Simplifying Rational Expressions

Goals: #1 - I can simplify rational expressions by noticing patterns and factoring.

Homework: Section 11.3 Worksheet

Warm Up:

1. Using the given values of x and y and the type of variation listed, write an equation that relates x and y.
   a. $x = 24,\ y = 78$; direct

$y = kx$
$78 = k \cdot 24$
$k = \frac{13}{4}$

$\boxed{y = \frac{13}{4}x}$

   b. $x = 4,\ y = 6$; inverse

$y = \frac{k}{x}$
$6 = \frac{k}{4}$
$k = 24$

$\boxed{y = \frac{24}{x}}$

Exploration #1: Work with a partner and simplify the following fractions.

1. $\frac{28 \div 7}{63 \div 7}$ $\boxed{\frac{4}{9}}$

2. $\frac{77 \div 11}{44 \div 11}$ $\boxed{\frac{7}{4}}$

3. $\frac{13 \div 13}{65 \div 13}$ $\boxed{\frac{1}{5}}$

Notes:

A rational number is a number that can be written as a fraction.

A fraction whose numerator and denominator are polynomials is a rational expression. **Example:** $\frac{x-4}{x}$, $\frac{x^2-2x-3}{x+4}$

To simplify rational expressions, we factor the numerator and denominator and then divide out any common factors.

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Example #1: Simplify the rational expression, if possible.

1. $\frac{14x}{7}$ $\frac{2 \cdot x}{1}$

$2x$

2. $\frac{6x}{9x^2}$ $\frac{3 \cdot 2 \cdot x}{3 \cdot 3 \cdot x \cdot x}$

$\frac{2}{3x}$

You practice: Simplify the rational expression, if possible.

1. $\frac{36x^2}{2x}$ $\frac{3 \cdot 3 \cdot 2 \cdot x \cdot x}{2x}$

$18x$

2. $\frac{5x}{40x^3}$ $\frac{5 \cdot x}{5 \cdot 4 \cdot 2 \cdot x \cdot x \cdot x}$

$\frac{1}{8x^2}$

Example #2: Simplify the rational expression, if possible.

1. $\frac{x(x^2+6)}{x^2}$ $\frac{x \cdot (x^2+6)}{x \cdot x}$

$\frac{x^2+6}{x}$

2. $\frac{x}{x+4}$

already simplified

You practice: Simplify the rational expression, if possible.

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

$\frac{3-x}{x}$

2. $\frac{2x^2}{x(x+5)}$ $\frac{2 \cdot x \cdot x}{x \cdot (x+5)}$

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

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Example #3: Simplify the rational expression, if possible.

1. $\frac{2x^2 - 6x}{6x^2}$ → $\frac{2x(x-3)}{6x^2}$

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

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

2. $\frac{4m^3}{2m^3 + 8m^2}$ → $\frac{4m^3}{2m^2(m+4)}$

$\frac{2 \cdot 2 \cdot m \cdot m \cdot m}{2 \cdot m \cdot m \cdot (m+4)}$

$\boxed{\frac{2m}{m+4}}$

You practice: Simplify the rational expression, if possible.

1. $\frac{5x}{10x^2 - 5x}$ → $\frac{5x}{5x(2x-1)}$

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

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

2. $\frac{p^3 - p^2}{p^2}$ → $\frac{p^2(p-1)}{p^2}$

$\frac{p \cdot p \cdot (p-1)}{p \cdot p}$

$\boxed{p-1}$

Example #4: Simplify the rational expression, if possible.

1. $\frac{x^2 - 2x - 3}{x - 3}$

-3
$-3 + 1 = -2$

$x^2 - 3x + x - 3$

$x(x-3) + 1(x-3)$

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

$\boxed{x+1}$

2. $\frac{x^2 - 4}{x^2 - x - 2}$

-2
$-2 + 1 = -1$

$\frac{(x+2)(x-2)}{x^2 - 2x + 1x - 2}$

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

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

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

$\boxed{\frac{x+2}{x+1}}$

You practice: Simplify the rational expression, if possible.

1. $\frac{2n^2 - 8n + 8}{n - 2}$

$2 \cdot 8 = 16$
$-4 + -4 = -8$

$2n^2 - 4n - 4n + 8$

$2n(n-2) - 4(n-2)$

$\frac{(n-2)(2n-4)}{n-2}$

$\boxed{2n-4}$

2. $\frac{y^2 + 3y - 28}{y^2 - 16}$

-28
$7 + -4 = 3$

$y^2 + 7y - 4y - 28$

$y(y+7) - 4(y+7)$

$\frac{(y+7)(y-4)}{(y+4)(y-4)}$

$\boxed{\frac{y+7}{y+4}}$

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