12-2 Undefined and Simplifying Rational Expressions

expression which can be written in the form $\frac{polynomial}{polynomial}$ is a rational expression.

Examples of rational expressions are below.

$\frac{1}{x}$ $\qquad$ $\frac{x+2}{2x-8}$ $\qquad$ $\frac{x^2-5}{x^2-10x+25}$

Before we begin simplifying these rational expressions, we must *determine which value(s) will make each fraction* ***undefined.*** Undefined fractions have a denominator of 0. To determine which value(s) will make the fraction undefined, you can set the denominator equal to 0 and solve for the variable.

$\frac{4}{0}$

$\frac{1}{x}$ $\qquad$ $\frac{x+2}{2x-8}$ $\qquad$ $\frac{x^2-5}{x^2-10x+25}$ $\qquad$ 1, 25

$x = 0$

$2x - 8 = 0$
$+8 \quad +8$
$\frac{2x}{2} = \frac{8}{2}$
$x = 4$

$x^2 - 10x + 25 = 0$
$(x-5)(x-5) = 0$
$x-5=0 \qquad x-5=0$
$x = 5 \qquad x = 5$

A rational expression is in simplest form if the numerator and denominator have no common factors except 1. Factor both the numerator and denominator (if necessary) by **FIRST factoring out the GCF.**

1. $\frac{6x+12}{x+2} = \frac{6(x+2)}{(x+2)} = \frac{6}{1} = 6$

2. $\frac{2x}{4x^2-6x} = \frac{2x}{2x(2x-3)} = \frac{1}{(2x-3)}$

$\frac{4m-2}{2m-1} = \frac{2(2m-1)}{(2m-1)} = \frac{2}{1} = 2$

You may also need to factor a quadratic expression to simplify a rational expression.

4. $\dfrac{2x-12}{x^2-3x-18} = \dfrac{2(x-6)}{(x+3)(x-6)} = \dfrac{2}{(x+3)}$

$x^2-3x-18$

5. $\dfrac{c^2-c-6}{c^2+5c+6} = \dfrac{(c+2)(c-3)}{(c+2)(c+3)} = \dfrac{(c-3)}{(c+3)}$

6. $\dfrac{x^2+9x-10}{x^3-x^2} = \dfrac{(x+10)(x-1)}{x^2(x-1)} = \dfrac{(x+10)}{x^2}$

So what if you factor the expression and opposite factors appear such as $\dfrac{(3-x)}{(x-3)}$.

$\dfrac{(x-3)}{(x-3)} = 1$ $\quad$ $\dfrac{(x+3)}{(x+3)} = 1$ $\quad$ $\dfrac{(3+x)}{(x+3)} = 1$ $\quad$ * $\dfrac{(3-x)}{(x-3)} = -1$

8. $\dfrac{5x-15}{9-x^2} = \dfrac{5(x-3)}{(3+x)(3-x)} = \dfrac{-5}{(3+x)}$

9. $\dfrac{2c^2-2}{3-3c^2} = \dfrac{2(c^2-1)}{3(1-c^2)} = \dfrac{2(c+1)(c-1)}{3(1+c)(+c)} = \dfrac{-2}{3}$

Practice 12-2 Name_____

For the problems below, simplify the expression in Column A and match it with the equivalent expression in Column B

Column A	Show Work	Column B
$\frac{3x-9}{3x}$		$\frac{x-1}{y-1}$
$\frac{6x-9}{4x-6}$		$\frac{x+2}{x+4}$
$\frac{x^2-x}{xy-x}$		$\frac{3}{2}$
$\frac{x+7}{x^2-49}$		$\frac{x+3}{5}$
$\frac{x^2+7x+12}{5x+20}$		$\frac{x-3}{x}$
$\frac{x^2-x-6}{x^2+x-12}$		$-\frac{2(x+2)}{8+x}$
$\frac{2x^2-12x-32}{64-x^2}$		x
$\frac{x^5-x^4}{x^4-x^3}$		$\frac{1}{x-7}$