**12.4: Simplify Rational Expressions**

**Goals: \***Identify excluded values of rational expressions

 **\***Simplify rational expressions by factoring using the GCF

 **\***Simplify rational expressions by factoring into two binomials

**Rational expression:** an expression that can be written as a ratio of 2 polynomials, where the dominator is not 0

**Excluded values:** numbers that would make the rational expression undefined (the denominator = 0)

**Find excluded values for each rational expression:**

**Ex: ** $\frac{x+8}{10x}$ **Ex:** $\frac{5}{2y+14}$** Ex:** $\frac{4v}{v^{2}-9}$****

$x\ne 0$ $2y+14\ne 0$ $v^{2}-9\ne 0$

 $y\ne -7$ $ v\ne \pm 3$

**Ex:  Ex:** $\frac{x+2}{3x-5}$** Ex:**$\frac{2}{5y^{2}+2y+3}$****

None $x\ne \frac{5}{3}$ None

**Ex:** $\frac{n-6}{2n^{2}-5n-12}$** Ex:** $\frac{2m}{m^{2}-4}$****

(2*n* – 3)(*n* – 4) (*m* + 2)(*m* – 2)

$n\ne \frac{3}{2}, n\ne 4$ $m\ne \pm 2$

**Simplest Form:** a rational expression is in simplest form when the numerator and denominator have no common factors other than 1

**Simplify each rational expression and state the excluded values.**

**Ex:** $\frac{r}{2r}$** Ex:** $\frac{5x}{5(x+2)}$** Ex:** $\frac{6m^{3}-12m^{2}}{18m^{2}}$****

$r\ne 0, \frac{1}{2}$ $x\ne -2, \frac{x}{x+2}$ $m\ne 0, \frac{m-2}{3}$

**Ex:** $\frac{y}{7-y}$** Ex:** $\frac{4a^{3}}{22a^{6}}$** Ex:** $\frac{2c}{c+5}$****

$y\ne 7, simplfied$ $a\ne 0, \frac{2}{11a^{3}}$ $c\ne -5, simplified$

**Ex:** $\frac{2s^{2}+8s}{3s+12}$ ** Ex: **$\frac{8x}{8x^{3}+16x^{2}}$

$s\ne -4, \frac{2s}{3}$$x\ne 0 or-2, \frac{1}{x^{2}+2x}$

**Simplify by factoring into binomials and state excluded values:**

**Ex:** $\frac{x^{2}-3x-10}{x^{2}+6x+8}$** Ex: **$\frac{x^{2}+x-12}{x^{2}-x-6}$

$\frac{(x-5)(x+2)}{(x+4)(x+2)}, x\ne -4 or-2$ $\frac{(x-3)(x+4)}{(x-3)(x+2)}, x\ne 3 or-2$

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

**Ex: **$\frac{x^{2}+3x+2}{x^{2}+7x+10}$ **Ex: **$\frac{y^{2}-64}{y^{2}-16y+64}$

$\frac{(x+2)(x+1)}{(x+5)(x+2)}, x\ne -5 or-2$ $\frac{(y-8)(y+8)}{(y-8)(y-8)}, y\ne 8$

$\frac{x+1}{x+5}$ $\frac{y+8}{y-8}$

**Recognize Opposites:**

**Ex: ** $\frac{x^{2}-7x+12}{16-x^{2}}$ **Ex:** $\frac{5+4z-z^{2}}{z^{2}-3z-10}$ ****

$\frac{(x-4)(x-3)}{(4-x)(4+x)}$ $\frac{(5-z)(1+z)}{(z-5)(z+2)}$

$-\frac{x-3}{x+4}$ $-\frac{z+1}{z+2}$

**Ex: **$\frac{x^{2}-7x+10}{25-x^{2}}$

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

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