

Name: Key
 Algebra 1

Date: _____
 Band: _____

Rational Expressions Study Guide

LT#1: Simplify rational expressions.

Simplify each expression. State any excluded values.

1. $\frac{2x^2+6x}{10x^3}$
 $\frac{\cancel{2}x(x+3)}{\cancel{10}x^3} = \frac{x+3}{5x^2}$

excluded values:

$\frac{10x^3 \neq 0}{10 \quad 10}$
 $\sqrt[3]{x^3 \neq 0}$
 $x \neq 0$

2. $\frac{m-3}{3m-9}$
 $\frac{\cancel{m-3}}{3(\cancel{m-3})} = \frac{1}{3}$

excluded values:

$\frac{3m-9 \neq 0}{+9 \quad +9}$
 $\frac{3m \neq 9}{3 \quad 3}$
 $m \neq 3$

3. $\frac{x^2+6x+9}{5x+15}$
 $\frac{(x+3)(x+3)}{5(x+3)} = \frac{x+3}{5}$

excluded values:

$\frac{5x+15 \neq 0}{-15 \quad -15}$
 $\frac{5x \neq -15}{5 \quad 5}$
 $x \neq -3$

4. $\frac{2a^2-4a+2}{3a^2-3}$

$\frac{2(a^2-2a+1)}{3(a^2-1)} = \frac{2(a-1)(a-1)}{3(a-1)(a+1)}$

$= \frac{2(a-1)}{3(a+1)}$

excluded values:

$\frac{3a^2-3 \neq 0}{+3 \quad +3}$
 $\frac{3a^2 \neq 3}{3 \quad 3}$
 $\sqrt{a^2 \neq 1}$

$a \neq 1, a \neq -1$

5. $\frac{2s^2-5s-12}{2s^2-9s+4}$

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

excluded values:

$2s^2-9s+4 \neq 0$
 $(2s-1)(s-4) \neq 0$
 $\frac{2s-1 \neq 0}{+1 \quad +1} \quad \frac{s-4 \neq 0}{+4 \quad +4}$
 $\frac{2s \neq 1}{2 \quad 2} \quad s \neq 4$
 $s \neq \frac{1}{2}$

6. $\frac{4-c}{2c-8}$

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

excluded values:

$\frac{2c-8 \neq 0}{+8 \quad +8}$
 $\frac{2c \neq 8}{2 \quad 2}$
 $c \neq 4$

LT#2: Multiply and divide rational expressions.

LT#3: Simplify complex fractions.

Multiply or divide.

$$7. \frac{4x+12}{x^2-2x} \cdot \frac{x}{6x+18}$$

$$\frac{\overset{2}{4}(x+3)}{\underset{1}{x}(x-2)} \cdot \frac{\overset{1}{\cancel{x}}}{\underset{3 \cdot 1}{6}(x+3)} = \boxed{\frac{2}{3(x-2)}}$$

$$8. \frac{a^2+5a+4}{a^3} \div \frac{a^2+3a+2}{a^2-2a}$$

$$\frac{a^2+5a+4}{a^3} \cdot \frac{a^2-2a}{a^2+3a+2}$$

$$\frac{(a+4)\overset{1}{\cancel{a}}}{\underset{a^2}{a^3}} \cdot \frac{\overset{1}{\cancel{a}}(a-2)}{(a+2)\underset{1}{\cancel{a+1}}} = \boxed{\frac{(a+4)(a-2)}{a+2}}$$

$$9. \frac{x^2+13x+40}{x-7} \div \frac{x+8}{x^2-49}$$

$$\frac{x^2+13x+40}{x-7} \cdot \frac{x^2-49}{x+8}$$

$$\frac{\overset{1}{\cancel{x+8}}(x+5)}{\underset{1}{\cancel{x-7}}} \cdot \frac{\overset{1}{\cancel{x-7}}(x+7)}{\underset{1}{\cancel{x+8}}} = \boxed{(x+5)(x+7)}$$

LT#4: Add and subtract rational expressions.

Add or subtract.

$$10. \frac{8x}{x+1} - \frac{3}{x+1} = \boxed{\frac{8x-3}{x+1}}$$

$$11. \frac{6}{7x} + \frac{1}{4} = \frac{6 \cdot 4}{7x \cdot 4} + \frac{1 \cdot 7x}{4 \cdot 7x}$$

$$\text{LCD} = 28x$$

$$\frac{24}{28x} + \frac{7x}{28x} = \boxed{\frac{24+7x}{28x}}$$

$$12. \frac{5}{2+x} + \frac{x}{x-4} = \frac{5(x-4)}{(2+x)(x-4)} + \frac{x(2+x)}{(x-4)(2+x)}$$

$$\text{LCD} = (2+x)(x-4)$$

$$\frac{5x-20+2x+x^2}{(2+x)(x-4)} = \boxed{\frac{x^2+7x-20}{(2+x)(x-4)}}$$

$$13. \frac{9}{3x-1} - \frac{5x}{2x+3} = \frac{9(2x+3)}{(3x-1)(2x+3)} - \frac{5x(3x-1)}{(2x+3)(3x-1)}$$

$$\text{LCD} = (3x-1)(2x+3)$$

$$\frac{18x+27-(15x^2-5x)}{(3x-1)(2x+3)}$$

$$\frac{18x+27-15x^2+5x}{(3x-1)(2x+3)} = \boxed{\frac{-15x^2+23x+27}{(3x-1)(2x+3)}}$$