

Name: \_\_\_\_\_

Date: \_\_\_\_\_

<p><b>Learning Goal 6.1</b></p>	<p>Simplifying and applying operations to rational expressions, identifying any non-permissible values.</p>
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**Rational Expressions** A fractional expression that has polynomials in both the numerator and the denominator.

- Non-permissible Values

are when the denominator is equal to zero.

\* find these first \*

- Fully Simplified

eliminate any common factors between the numerators and denominators.

\* lots of factoring \*

**Example** Simplify each rational expressions and state the non-permissible values.

a.  $\frac{15x^2yz^3}{20xyz} \div \frac{5}{5} \leftarrow \text{NPV:}$

$x \neq 0$   
 $y \neq 0$   
 $z \neq 0$

$$= \frac{3x^2yz^3}{4xyz}$$

$$= \frac{3xy z^3}{4yz}$$

$$= \frac{3xz^3}{4z}$$

$$= \frac{3xz^2}{4}$$

b.  $\frac{1-t}{t^2-1} = \frac{-t}{t^2-t}$

~~$\frac{-t}{t^2-t}$~~

$$= \frac{1-t}{(t+1)(t-1)}$$

$$= \frac{-(-1+t)}{(t+1)(t-1)}$$

$$= \frac{-(t-1)}{(t+1)(t-1)}$$

$$= \frac{-1}{t+1}$$

NPV:  
 $t^2 - 1 \neq 0$   
 $t^2 \neq 1$   
 $t \neq \pm 1$

c.  $\frac{3x^2 - 8x}{2x}$  NPV:  $2x \neq 0$   
 $x \neq 0$

$$= \frac{x(3x-8)}{2x}$$

$$= \frac{3x-8}{2}$$

d.  $\frac{16x^2 - 9y^2}{8x - 6y}$  NPV:  $8x - 6y \neq 0$   
 $8x \neq 6y$   
 $x = \frac{6y}{8}$

$$= \frac{(4x+3y)(4x-3y)}{2(4x-3y)}$$

$$= \frac{4x+3y}{2}$$

e.  $\frac{3x-6}{2x^2+x-10}$

$$2x^2 + x - 10 \quad \begin{array}{l} +5x - 4 = -20 \\ +5 + -4 = 1 \end{array}$$

$$= 2x^2 + 5x - 4x - 10$$

$$= x(2x+5) - 2(2x+5)$$

$$= (2x+5)(x-2)$$

NPV:  $(2x+5)(x-2) \neq 0$

$$\begin{array}{l} \downarrow \qquad \qquad \downarrow \\ 2x+5 \neq 0 \qquad x-2 \neq 0 \\ 2x \neq -5 \qquad \qquad \underline{x \neq 2} \\ \underline{x \neq -\frac{5}{2}} \end{array}$$

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

$$= \frac{3}{2x+5}$$

f.  $\frac{16-x^2}{2x^2-11x+12}$   $16-x^2 = (4+x)(4-x)$

$$2x^2 - 11x + 12 \quad \begin{array}{l} -3 \times -8 = 24 \\ -3 + -8 = -11 \end{array}$$

$$= 2x^2 - 3x - 8x + 12$$

$$= x(2x-3) - 4(2x-3)$$

$$= (2x-3)(x-4)$$

NPV:  $(2x-3)(x-4) \neq 0$

$$\begin{array}{l} \downarrow \qquad \qquad \downarrow \\ 2x-3 \neq 0 \qquad x-4 \neq 0 \\ 2x \neq 3 \qquad \qquad x \neq 4 \\ \underline{x \neq \frac{3}{2}} \end{array}$$

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

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