

# Simplifying Rational Expressions

March-15-19  
11:31 AM

## PRE-CALCULUS 11 RATIONAL EXPRESSIONS SIMPLIFYING RATIONAL EXPRESSIONS

### A. Definitions

1. **rational expression:** an algebra expression that can be written in the form of a fraction.

$$\frac{5}{2x} \quad , \quad \frac{x^2 - 3x - 5}{2x^2 - 18}$$

2. **non-permissible values (undefined value):** values that make the denominator of the fraction zero.  $\frac{5}{0} = \text{unsolvable.}$

### B. Determining Non-permissible Values

1) Determine the non-permissible values for each rational expressions.

a)  $\frac{x-1}{x+4}$

$$x + 4 = 0$$

$$x \neq -4$$

b)  $\frac{3x+y}{5x}$

$$5x = 0$$

$$x \neq 0$$

c)  $\frac{x+2}{x^2-x-6}$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0$$

$$x \neq 3, -2$$

d)  $\frac{x}{x^2+1}$

$$x^2 + 1 = 0$$

$$x^2 = -1$$

$$x = \pm\sqrt{-1} \text{ unsolvable.}$$

$$x \in \mathbb{R}$$

$$\begin{array}{c} -6 \\ -3 \quad 2 \\ -1 \end{array}$$

### C. Simplifying Rational Expressions

1) Determine the non-permissible values and simplify the following.

a)  $\frac{28}{7x}$   $x \neq 0$

$$= \frac{4}{x}$$

b)  $\frac{25m^3}{40m^2n}$   $m \neq 0, n \neq 0$

$$= \frac{5n^2}{8m}$$

c)  $\frac{2x^2 - 4x}{2x}$  <sup>Expression</sup>  $x \neq 0$

$\frac{\cancel{2}x(x-2)}{\cancel{2}x}$  <sup>Term</sup> <sup>Expression</sup> <sup>Term</sup>

$x - 2$

\* d)  $\frac{2x-4}{8-4x}$  <sup>Exp</sup>  $\frac{2x-4}{-4x+8}$  <sup>Exp</sup>  $-4x+8=0$   
 $\frac{-4x}{-4} = \frac{-8}{-4}$   
 $x \neq 2$

$\frac{\overset{T}{2}(\overset{E}{x-2})}{\underset{T}{-4}(\overset{E}{x-2})}$

$-\frac{1}{2}$

$\frac{15}{-3 \times -5}$   
 $-8$

e)  $\frac{x^2 - 8x + 15}{x - 3}$  <sup>E</sup>  $x \neq 3$

$\frac{(x-3)(x-5)}{\cancel{x-3}}$  <sup>E</sup> <sup>E</sup> <sup>E</sup>

$x - 5$

f)  $\frac{x+4}{x^2 - x - 20}$  <sup>E</sup> <sup>E</sup>

$x^2 - x - 20 = 0$   
 $(x-5)(x+4) = 0$

$\frac{-20}{-5 \times -4}$   
 $-1$

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

$\frac{1}{x-5}$

$x \neq 5, -4$

g)  $\frac{3x^3 - 12x^2}{x^2 - 16}$

$x^2 - 16 = 0$   
 $(x+4)(x-4) = 0$

$x \neq -4, 4$

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

$\frac{3x^2}{x+4}$

h)  $\frac{2x^2 - 5x - 3}{9 - x^2}$

$\frac{2x^2 - 5x - 3}{-x^2 + 9}$

$\frac{-6}{-5}$   
 $-1$

$\frac{(x-\frac{6}{2})(x+1)}{(\cancel{x-3})(2x+1)}$   
 $\frac{-1(x+3)(\cancel{x-3})}{-1(x+3)(\cancel{x-3})}$

$-x^2 + 9 = 0$   
 $-1(x^2 - 9) = 0$   
 $-1(x+3)(x-3) = 0$

$x \neq -3, 3$

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

$\frac{-1(2x+1)}{x+3}$  or  $\frac{-2x-1}{x+3}$

Assignment: Pg. 527 #5, 7, 8, 11