



## Excluded Values

An excluded value is a real number that makes a rational expression undefined.

$$\text{denominator} \neq 0$$

ex: State the excluded values, then simplify if possible.

$$a) \frac{5}{x^2 - 25} = \frac{5}{(x-5)(x+5)}$$

$$x \neq \pm 5$$

ex: State the excluded values, then simplify if possible.

$$b) \frac{3x-9}{x^2-4x+3} = \frac{3(\cancel{x-3})}{(x-1)(\cancel{x-3})} = \boxed{\frac{3}{x-1}}$$

$$(x-3)(x-1) \neq 0$$

excluded values :  $x \neq 3, 1$

ex: State the excluded values, then simplify if possible.

get  $c) \frac{4x^2 - 4x - 32x + 32}{2x^2 + 8x - 10}$

get  $\frac{4x^2 - 4x - 32x + 32}{2x^2 + 8x - 10}$

$\frac{4(x^2 - x - 8x + 8)}{2(x^2 + 4x - 5)}$  Grouping  
or  
Combine terms

$x(x-1) - 8(x-1)$   
 $(x-1)(x-8)$

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

$\frac{2(x-1)(x-8)}{(x-1)(x+5)}$   $\leftarrow$   $x \neq 1, -5$

$\frac{2(x-8)}{x+5}$

ex: Perform the indicated operation. Simplify if possible.

a)  $\frac{(x-1)}{x-1} \cdot \frac{(4x+1)}{x+2} + \frac{(x)}{x-1} \cdot \frac{(x+2)}{x+2}$

LCM:  $(x+2)(x-1)$

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

$$\frac{5x^2 - x - 1}{(x-1)(x+2)}$$

$$x \neq 1, -2$$

ex: Perform the indicated operation. Simplify if possible.

b)  $\frac{x+4}{x^2-9} - \frac{4}{2x-6}$

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

LCM:  $2(x+3)(x-3)$

$$\frac{2x+8}{2(x+3)(x-3)} - \frac{4x+12}{2(x-3)(x+3)}$$

$$\frac{2x+8-4x-12}{2(x+3)(x-3)}$$

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

Factor out negative gcf →

$$-2(x+2)$$

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

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

$$\boxed{x \neq \pm 3}$$



ex: Perform the indicated operation. Simplify if possible.

$$c) \frac{x^2 + 3x}{8x^2 - 32x} \div \frac{3x^2 + x - 24}{4x}$$

Keep change flip

$$\frac{x^2 + 3x}{8x^2 - 32x} \cdot \frac{4x}{3x^2 + x - 24}$$

$$\frac{\cancel{x}(x+3)}{8x^2 - 32x} \cdot \frac{4x}{3x^2 + x - 24}$$

$$\frac{\cancel{x}(x+3)}{2(x-4)} \cdot \frac{4x}{(3x-8)(\cancel{x+3})}$$

$$\frac{x}{2(x-4)(3x-8)}$$

$$\begin{array}{l} -72 \\ \left( \frac{3x}{-8} + 9 \right) \div 3 \end{array}$$

$$x \neq 0, 4, \frac{8}{3}, -3$$

ex: Perform the indicated operation. Simplify if possible.

$$d) \frac{5x+1}{x^3+1} + \frac{7x}{3x+3}$$

cube's  
(SOAP)  
gcf

LCM:

$$3(x+1)(x^2-x+1)$$

$$\frac{3(5x+1)}{3(x+1)(x^2-x+1)} + \frac{7x(x^2-x+1)}{3(x+1)(x^2-x+1)}$$

$$\frac{15x+3}{3(x+1)(x^2-x+1)} + \frac{7x^3-7x^2+7x}{3(x+1)(x^2-x+1)}$$

Factor by grouping?  
 ~~$7x^2(x-1) + 22x + 3$~~   
xso!

$$\frac{7x^3-7x^2+22x+3}{3(x+1)(x^2-x+1)}$$

imaginary

$$x \neq -1$$

ex: Perform the indicated operation. Simplify if possible.

$$e) \frac{x^2 - 5x - 36}{x^2 - 49} \cdot \left( \frac{x^2 - 11x + 28}{x^2 - 49} \right)$$

DOS

$$\frac{(x+4)(x-9)}{(x+7)(x-7)} \cdot \frac{(x-4)(x-7)}{(x-4)(x-7)}$$

$$\left[ \frac{(x+4)(x-9)(x-4)}{(x+7)} \right] \left[ x \neq \pm 7 \right]$$

ex: Perform the indicated operation. Simplify if possible.

$$f) \frac{5}{6x-18} - \frac{x-1}{4x^2-14x+6}$$

$$2(2x^2-7x+3) + 6$$

$$2(2x-1)(x-3)$$

$\left(\frac{2x}{-1}, \frac{2x}{6}\right)$

$$\frac{5(2x-1)}{6(x-3)(2x-1)} - \frac{3(x-1)}{3 \cdot 2(2x-1)(x-3)}$$

LCM:

$$6(x-3)(2x-1)$$

$$\frac{10x-5}{6(x-3)(2x-1)} \oplus \frac{-3x+3}{6(x-3)(2x-1)}$$

|                |
|----------------|
| $7x-2$         |
| $6(x-3)(2x-1)$ |

|                         |
|-------------------------|
| $x \neq 3, \frac{1}{2}$ |
|-------------------------|

ex: Perform the indicated operation. Simplify if possible.

g)  $\frac{4x}{x+6}$

$\frac{x^2+3x-18}{1}$  ←  $\div$

$\frac{4x}{x+6} \div \frac{x^2+3x-18}{1}$

keep change flip

$\frac{4x}{x+6} \cdot \frac{1}{x^2+3x-18}$

$\frac{4x}{(x+6)} \cdot \frac{1}{(x+6)(x-3)}$

$= \frac{4x}{(x+6)^2(x-3)}$   
|  $x \neq -6, 3$  |

ex: Perform the indicated operation. Simplify if possible.

$$h) 6 - \frac{x+5}{x^2+5}$$

$$x^2+5=0$$

$$\frac{6(x^2+5)}{1(x^2+5)} - \frac{x+5}{x^2+5}$$

$$\sqrt{x^2} = \sqrt{-5}$$

imaginary!

$$\frac{6x^2+30}{x^2+5} \oplus \frac{-x-5}{x^2+5}$$

$$\boxed{\frac{6x^2-x+25}{x^2+5}}$$

ex: Perform the indicated operation. Simplify if possible.

$$i) \frac{x}{x-2} - \left[ \frac{x}{5} \div \frac{x^3 - 4x}{15x + 5} \right]$$

use  
order of operations

keep change flip

$$x^3 - 4x$$

$$\frac{x}{x-2} - \left[ \frac{x}{5} \cdot \frac{\cancel{5}(3x+1)}{\cancel{5}(x+2)(x-2)} \right]$$

$$x(x^2 - 4)$$

DOES

LCM:  $(x+2)(x-2)$

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

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

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

$$\boxed{x \neq 2, 0, -2, -\frac{1}{3}}$$

ex: Perform the indicated operation. Express your answer in simplest form.

$$j) \frac{x-3}{x+2} \div \frac{5x^2-45}{x^2-2x-8} \cdot \frac{5}{x-4}$$

Use  
order of operations  
L  $\rightarrow$  R

keep change flip

$$\left[ \frac{\cancel{x}3}{\cancel{x}+2} \cdot \frac{(x-4)(\cancel{x}+2)}{5(x+3)(\cancel{x}-3)} \right] \cdot \frac{5}{x-4}$$

$$\frac{\cancel{x}-4}{5(x+3)} \cdot \frac{1}{\cancel{5}}$$

$$\left[ \frac{1}{x+3} \right]$$

$$\left[ x \neq -2, \pm 3, 4 \right]$$

$$5x^2 = 45$$

$$5(x^2 = 9)$$

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