

6.2 – Multiplying and Dividing Rational Expressions

Similarly to numerical fractions, we are going to use:

$$\boxed{\frac{A}{B} \times \frac{C}{D} = \frac{AC}{BD}} \quad \text{and} \quad \boxed{\frac{A}{B} \div \frac{C}{D} = \frac{A}{B} \times \frac{D}{C}}$$

ATTENTION : In the 1st formula, the original expression exists if $B \neq 0$ and $D \neq 0$
 In the 2nd formula, the original expression exists if $B \neq 0$, $D \neq 0$ and $C \neq 0$

Examples : 1) $A = \frac{x^2-x-12}{x^2-9} \times \frac{x^2-4x+3}{x^2-4x}$

Restrictions : $x^2-9 \neq 0$ and $x^2-4x \neq 0$
 $(x+3)(x-3) \neq 0$ $x(x-4) \neq 0$
 $x \neq \pm 3$ $x \neq 0$ $x \neq 4$

$$D = \mathbb{R} \setminus \{-3, 0, 3, 4\}$$

Simplification : $A = \frac{\cancel{(x-4)}\cancel{(x+3)}\cancel{(x-3)}(x-1)}{\cancel{(x+3)}\cancel{(x-3)}x\cancel{(x-4)}} = \frac{x-1}{x}$

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2) $\frac{x^2-4}{x^2-4x} \div \frac{x^2+x-6}{x^2+x-20} = B$

Restrictions : $x^2-4x \neq 0$ $x^2+x-20 \neq 0$ and $x^2+x-6 \neq 0$
 $x(x-4) \neq 0$ $(x+5)(x-4) \neq 0$ $(x+3)(x-2) \neq 0$
 $D = \mathbb{R} \setminus \{-5, -3, 0, 2, 4\}$

Simplification : $B = \frac{x^2-4}{x^2-4x} \times \frac{x^2+x-20}{x^2+x-6}$
 $= \frac{(x+2)\cancel{(x-2)}(x+5)\cancel{(x-4)}}{x\cancel{(x-4)}(x+3)\cancel{(x-2)}}$
 $= \frac{(x+2)(x+5)}{x(x+3)}$

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