

6.2 Multiplying and Dividing Rational Expressions

Example 1: Multiply the following rational expressions:

$$\text{a) } \frac{a^2 - a - 12}{a^2 - 9} \cdot \frac{a^2 - 4a + 3}{a^2 - 4a}$$

$$= \frac{\cancel{(a-4)}\cancel{(a+3)}}{\cancel{(a+3)}\cancel{(a-3)}} \cdot \frac{\cancel{(a-3)}(a-1)}{a\cancel{(a-4)}}$$

n.p.v.
 $a \neq 0, \pm 3, 4$

$$= \boxed{\frac{a-1}{a}}$$

- ① factor numerator & denominator completely
- ② state n.p.v.
- ③ cancel factors

$$\text{b) } \frac{x^2 + x - 6}{x^2 + 2x - 15} \cdot \frac{x-3}{x-2}$$

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

n.p.v. $x \neq -5, 3, 2$

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

Example 2: Divide the following rational expressions:

a) $\frac{x^2-x-20}{x^2-6x} \div \frac{x^2+9x+20}{x^2-12x+36}$

$$= \frac{(x-5)(x+4)}{x(x-6)} \div \frac{(x+5)(x+4)}{(x-6)(x-6)}$$

npr $x \neq 0, 6$

$$= \frac{(x-5)(x+4) \cdot \cancel{(x-6)}(x-6)}{x \cancel{(x-6)} (x+5)(x+4)}$$

$$= \frac{(x-5)(x-6)}{x(x+5)}$$

npr. $x \neq 0, 6, -5, -4$

b) $\frac{x^2+15x+56}{x^2-3x-54} \div \frac{x^2+6x-16}{x^2+4x-12}$

$$\frac{(x+8)(x+7)}{(x-9)(x+6)} \div \frac{(x+8)(x-2)}{(x+6)(x-2)}$$

npr $\Rightarrow x \neq -6, 2, 9$

$$\frac{\cancel{(x+8)}(x+7)}{(x-9)\cancel{(x+6)}} \cdot \frac{\cancel{(x+6)}\cancel{(x-2)}}{\cancel{(x+8)}\cancel{(x-2)}}$$

$$= \frac{x+7}{x-9}$$

npr $x \neq -6, 2, 9, -8$

- ① factor numer/denom.
- ② state npr
- ③ kiss 'n' flip: multiply by the reciprocal
- ④ state any extra npr
- ⑤ cancel factors