

Chapter 6(I) Rational Expressions
6.2 Multiplying and Dividing Rational Expressions

* Always **FACTOR** first!!!

Multiplying Rational Expressions

We multiply rational expressions together the same way we multiply fractions together.

- Multiply numerators together
- Multiply denominators together
- Reduce any common factors (this may be done prior to multiplying also)

Ex. $\frac{2}{3} \times \frac{6}{7} = \frac{4}{7}$

Non-Permissible Values

We must look at ALL denominators. NO denominator can be zero.

Ex. Multiply. State the non-permissible values.

a) $\frac{m^2}{3x^3} \cdot \frac{3xy^3n^2}{mn} = \boxed{3mn^2}$ NPV $3n^3 \neq 0$ $mn \neq 0$
 $n \neq 0$ $m \neq 0, n \neq 0$ $\therefore m \neq 0, n \neq 0$

b) $\frac{3xy}{4y^2} \cdot \frac{12x^2y}{7x^2x} = \boxed{\frac{3}{7xy}}$ NPV $4y^3 \neq 0$ $21x^4 \neq 0$
 $y \neq 0$ $x \neq 0$ $\therefore x \neq 0, y \neq 0$

c) $\frac{x^2+x-12}{x+2} \cdot \frac{3x+6}{x-3} = \frac{(x+4)(x/3)}{(x/2)} \cdot \frac{3(x+2)}{(x/3)} = \boxed{3(x+4)}$ NPV $x+2 \neq 0$ $x-3 \neq 0$
 $x \neq -2$ $x \neq 3$

d) $\frac{x-1}{x^2+7x+10} \cdot \frac{2x^2+3x-2}{1-x} = \frac{x/1}{(x/2)(x+5)} \cdot \frac{(2x-1)(x/2)}{1/x} = \boxed{\frac{-(2x-1)}{x+5}}$

NPV
 $x^2+7x+10 \neq 0$ $1-x \neq 0$
 $(x+2)(x+5) \neq 0$ $-x \neq -1$ $\therefore x \neq -2, -5, 1$
 $x \neq -2, -5$ $x \neq 1$

e) What is the product of $\frac{p^2-4}{2p-3}$ and $\frac{8p-12}{4-2p}$?

$\frac{p^2-4}{2p-3} \cdot \frac{8p-12}{4-2p} = \frac{(p+2)(p-2)}{2p-3} \cdot \frac{2(3p-3)}{2(2-p)} = \boxed{-2(p+2)}$

NPV $2p-3 \neq 0$ $4-2p \neq 0$
 $p \neq \frac{3}{2}$ $p \neq 2$ $\therefore p \neq \frac{3}{2}, 2$

Dividing Rational Expressions

We multiply rational expressions together the same way we divide fractions together.

- Change to multiplying by the reciprocal
- Multiply as before

$$\text{Ex. } \frac{2}{3} \div \frac{14}{9} = \frac{2}{3} \cdot \frac{9}{14} = \frac{3}{7}$$

Ex. Divide. State the non-permissible values.

$$\text{a) } \frac{15x^3y^2}{2x+3} \div \frac{30xy^4}{4x^2-9} = \frac{15x^3y^2}{2x+3} \times \frac{(2x+3)(2x-3)}{30xy^4} = \frac{x^2(2x-3)}{2y^2}$$

NPV

$$2x+3 \neq 0 \quad 4x^2-9 \neq 0 \quad 30xy^4 \neq 0$$

$$x \neq -\frac{3}{2} \quad (2x+3)(2x-3) \neq 0 \quad x \neq 0$$

$$x \neq -\frac{3}{2}, \frac{3}{2} \quad y \neq 0$$

$$\therefore x \neq -\frac{3}{2}, \frac{3}{2}, 0, y \neq 0$$

$$\text{b) } \frac{x+2y}{x-3y} \div \frac{x^2-4y^2}{x^2-9y^2} \div \frac{x+3y}{x-2y} = \frac{x+2y}{x-3y} \times \frac{(x+3y)(x-3y)}{(x+2y)(x-2y)} \times \frac{x-2y}{x+3y} = 1$$

NPV

$$x-3y \neq 0 \quad x^2-4y^2 \neq 0 \quad x-2y \neq 0 \quad x^2-9y^2 \neq 0 \quad x+3y \neq 0$$

$$x \neq 3y \quad (x+3y)(x-3y) \neq 0 \quad x \neq 2y \quad (x+2y)(x-2y) \neq 0 \quad x \neq -3y$$

$$x \neq -3y, 3y \quad x \neq -2y, 2y$$

$$\therefore x \neq \pm 3y, \pm 2y$$

$$\text{c) } \frac{4x^2-2x}{2x^2+9x-5} \div \frac{4x}{x+5} = \frac{2x(2x-1)}{(x+5)(2x-1)} \times \frac{x+5}{4x} = \frac{1}{2}$$

NPV

$$2x^2+9x-5 \neq 0 \quad x+5 \neq 0 \quad 4x \neq 0$$

$$(x+5)(2x-1) \neq 0 \quad x \neq -5 \quad x \neq 0$$

$$\therefore x \neq -5, 0, \frac{1}{2}$$

$$x \neq -5, \frac{1}{2}$$

Assignment: p. 327 #1, 2, 4, 6, 15, 16