Math 3201

4.3A Multiplying Rational Expressions

Steps:

- Where possible, factor the numerators and denominators of both expressions.
- Cancel common factors.
- Determine the restrictions by calculating the non-permissible values.
- State the simplified answer along with restrictions.

Example 1:

(A) $\frac{4x^2-20x}{18x} \cdot \frac{30x}{(x-5)}$

$x \neq 0, \quad x-5 \neq 0$
$x \neq 5$

$= \frac{4(x-5)}{18} \cdot \frac{30x}{(x-5)}$ ← put brackets around all binomials!!

$= \frac{120x}{18}$ ← reduce using calculator.

$= \frac{20x}{3}, x \neq 0, 5$

(B) $\frac{18x^3}{5x-15x^2} \cdot \frac{1-9x^2}{24x^2}$

$= \frac{18x^3}{5x(1-3x)} \cdot \frac{(1+3x)(1-3x)}{24x^2}$

$= \frac{18(1+3x)}{120}$

$= \frac{3(1+3x)}{20}, x \neq 0, \frac{1}{3}$

$x \neq 0, \quad 1-3x \neq 0$

$-3x \neq -1$

$\frac{-3}{-3} \neq \frac{-1}{-3}$

$x \neq \frac{1}{3}$

$\sqrt{x^2} \neq \sqrt{0}$

$x \neq 0$

(C) $\frac{2x^2-12x}{15x} \cdot \frac{5x}{x-6}$

$= \frac{2(x-6)}{15} \cdot \frac{5x}{(x-6)}$

$= \frac{10x}{15}$

$= \frac{2x}{3}, x \neq 0, 6$

Reversal of a Difference of Terms

A peculiar case happens when we get two terms reversed with a difference. Once we understand how it works we can use a shortcut from then on.

Example 2:

Simplify:

(A) $\frac{x-4}{4-x}$

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

$= \frac{(x-4)}{-1(x-4)}$

$= \frac{1}{-1} = -1, x \neq 4$

(B) $\frac{-2x(5-x)}{10x^2(x-5)}$

$= \frac{-2x}{10x^2}$

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

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

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

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

Textbook Questions: page 238, 239 #1(a,c), 2(a,b), 3(a,d),4(a,c), 5(a), 6, 9