

Feb 11 Park

MCR3U

Adding and Subtracting Rational Expressions

\* Quiz on Feb 17 (Tu) \* Unit Test on Feb 24 (Tu)

Example 1 Determine a Least Common Denominator (LCD) for each of the given fractions.

a)  $\frac{x}{6}$  and  $\frac{y}{15}$

CM = 30, 60, 90, 120

LCD = 30

b)  $\frac{a}{4x^2y}$  and  $\frac{b}{5y^2}$

CM =  $4x^2y$  and  $5y^2 = 20x^2y^2$

CD of 9 and 8 =  $9 \times 8 = 72$

CD of 3 and 9 = 9

\* Common Multiples : Multiples which are common to two or more numbers (or terms) = product  
 e.g.) common multiples of 2 and 3 = 6, 12, 18 etc.  
 \* "Find LCD" = "Find LCM"  
 || Least Common Multiple

Example 2 Simplify and state restrictions

a)  $\frac{x}{5} + \frac{2x}{5}$

=  $\frac{x + 2x}{5}$

=  $\frac{3x}{5}$ , no restrictions

c)  $\frac{x-1}{45} - \frac{(x+1)}{18}$

CD of 45, 18 =  $45 \times 18 = 810$

=  $\frac{18(x-1) - 45(x+1)}{810}$

=  $\frac{18x - 18 - 45x - 45}{810}$

=  $\frac{-27x - 63}{810}$

b)  $\frac{3x}{2} - \frac{x}{3} + \frac{5x}{6}$

= LCD of 2, 3, 6 = 6

=  $\frac{9x - 2x + 5x}{6}$

=  $\frac{12x}{6} \div 6$

=  $\frac{2x}{1} = 2x$ , no restrictions

Divide everything by 9

=  $\frac{-3x - 7}{90}$ , no restriction

$$(x-1) \times (1-3)$$

$$x - 3x - 1 + 3$$

$$-2x + 2$$

$$\frac{1}{3}$$

3

3

3

$$d) \frac{6x}{y} + \frac{3}{y^2}$$
 (Note:  $xy$  is written above  $\frac{6x}{y}$  and  $\frac{3}{y^2}$  with an arrow pointing to the  $3$  and the word "nothing" written above it.)

CM of  $y$  and  $y^2 = y^2$  (S1)

$$= \frac{6xy + 3}{y^2}, y \neq 0$$
 (S2)

$$= \frac{3(2y + 1)}{y^2}, y \neq 0$$
 (S4)

\* When adding or subtracting Rational Expressions, follow these steps:

- 1) Find a common denominator
- 2) State restrictions
- 3) Add the numerators = change the numerator to the new fraction (with new common denominator.)
- 4) Simplify or Factor
- 5) Write the final answer and state restrictions again!

$$e) \frac{2x}{x-2} - \frac{x+4}{x-2}$$

~~S1~~ (S2)  $x-2 \neq 0$   
 $x \neq 2$

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

$$= \frac{2x - x - 4}{x-2}$$

(S4)  $\frac{(x-4)}{(x-2)}, x \neq 2$

Homework: Pg. 93 #C3, 7, 10, 12\*, 13\*

P93 (C4) Simplify it.  

$$= \frac{5}{x+3} - \frac{7x}{x-1}$$
 (Note:  $3 \cdot 4 = 3 \times 4$  is written to the right)

(S1) CD =  $(x+3)(x-1)$

(S2)  $x+3 \neq 0 \rightarrow x \neq -3$

$x-1 \neq 0 \rightarrow x \neq 1$

$$(S3) = \frac{5(x-1) - (x+3) \cdot 7x}{(x+3)(x-1)}$$

$$= \frac{5x - 5 - 7x^2 - 21x}{(x+3)(x-1)}$$

(S4) 
$$= \frac{-7x^2 - 16x - 5}{(x+3)(x-1)}, x \neq -3, 1$$

HT doesn't work.  
 $\uparrow$   
 $ac = -7x - 5$   
 $ac = 35$   
 $b = -16$

$$p94 \quad 4a) \quad \frac{3x^2}{12x^2 + 18x} \times \frac{4x + 6}{3x + 30}$$

$$= \frac{3x^2 \times 4x + 6}{(12x^2 + 18x) \times (3x + 30)}$$

$\underbrace{\hspace{2cm}}_{6x} \qquad \underbrace{\hspace{2cm}}_3$

$$= \frac{3x^2 (4x + 6)}{18x (2x + 3) (x + 10)}$$

$$= \frac{16x^{\cancel{2}} (2x + 3)}{3 \cdot 18x (2x + 3) (x + 10)}$$

$$= \frac{x}{3(x + 10)}, \quad x \neq 0, -\frac{3}{2}, -10$$

Restriction:  $18x \neq 0 \rightarrow x \neq 0$

$$2x + 3 \neq 0 \rightarrow 2x \neq -3 \rightarrow x \neq -\frac{3}{2}$$

$$x + 10 \neq 0 \rightarrow x \neq -10$$