Algebra 2

Ch. 9 Handout 9.5

Adding/Subtracting Rational Expressions

Find the least common multiple (least common denominator) of each pair of polynomials.

$$2x^2 - 8x + 8 \text{ and } 15x^2 - 60$$

1 Find the prime factors of each expression

$2x^2 - 8x + 8$

$2(x^2 - 4x + 4)$

$2(x-2)(x-2)$

$2(x-2)^2$

$15x^2 - 60$

$15(x^2 - 4)$

$15(x-2)(x+2)$

2 Write each prime factor the greatest number of times it appears in either expression. Simplify where possible.

$30(x-2)^2(x+2)$

Find the least common multiple (least common denominator) of each pair of polynomials.

2. $3x^2 - 9x - 30$ and $6x + 30$

1 Find the prime factors of each expression

$3x^2 - 9x - 30$

$3(x^2 - 3x - 10)$

$3(x-5)(x+2)$

$6x + 30$

$6(x+5)$

2 Write each prime factor the greatest number of times it appears in either expression. Simplify where possible.

$6(x-5)(x+2)(x+5)$

Find the least common multiple (least common denominator) of each pair of polynomials.

3. $5x^2+15x+10$ and $2x^2-8$

1 Find the prime factors of each expression

$5x^2+15x+10$

$5(x^2+3x+2)$

$5(x+2)(x+1)$

$2x^2-8$

$2(x^2-4)$

$2(x-2)(x+2)$

2 Write each prime factor the greatest number of times it appears in either expression. Simplify where possible.

$10(x+2)(x+1)(x-2)$

Simplify each rational expression.

4. $\dfrac{x+2}{x^2} + \dfrac{x-2}{2x}$

$(2)\quad (x)2x$

LCD: $2x^2$

$= \dfrac{2x+4}{2x^2} + \dfrac{x^2-2x}{2x^2}$

$= \dfrac{2x+4+x^2-2x}{2x^2}$

$= \boxed{\dfrac{x^2+4}{2x^2}}$

Simplify each rational expression.

5. $\dfrac{1}{3x^2+21x+30} + \dfrac{4x}{3x+15}$

$\dfrac{1}{3(x^2+7x+10)} + \dfrac{4x}{3(x+5)}$

$\dfrac{1}{3(x+5)(x+2)} + \dfrac{4x(x+2)}{3(x+5)(x+2)}$ $\dfrac{1}{3(x+5)(x+2)} + \dfrac{4x^2+8x}{3(x+5)(x+2)}$

LCD = $3(x+5)(x+2)$ $= \dfrac{1 + 4x^2+8x}{3(x+5)(x+2)}$

$= \boxed{\dfrac{4x^2+8x+1}{3(x+5)(x+2)}}$

Simplify each rational expression.

6. $\dfrac{1}{y^2-y-2}+\dfrac{1}{y^2+y}$

$\dfrac{1(y)}{(y-2)(y+1)(y)}+\dfrac{1(y-2)}{y(y+1)(y-2)}=\dfrac{y}{y(y-2)(y+1)}+\dfrac{y-2}{y(y-2)(y+1)}$

LCD $= y(y-2)(y+1)$

$=\dfrac{y+y-2}{y(y-2)(y+1)}$

$=\dfrac{2y-2}{y(y-2)(y+1)}=\boxed{\dfrac{2(y-1)}{y(y-2)(y+1)}}$

Simplify each rational expression.

7. $\dfrac{8x}{x^2-x-6}+\dfrac{4}{x^2+4x+4}$

$\dfrac{8x}{(x-3)(x+2)}+\dfrac{4}{(x+2)(x+2)}$

$\dfrac{8x(x+2)}{(x-3)(x+2)(x+2)}+\dfrac{4(x-3)}{(x+2)^2(x-3)}=\dfrac{8x^2+16x}{(x-3)(x+2)^2}+\dfrac{4x-12}{(x-3)(x+2)^2}$

LCD $=(x-3)(x+2)^2$

$=\dfrac{8x^2+16x+4x-12}{(x-3)(x+2)^2}$

$=\dfrac{8x^2+20x-12}{(x-3)(x+2)^2}$

$=\dfrac{4(2x^2+5x-3)}{(x-3)(x+2)^2}$

$=\boxed{\dfrac{4(2x-1)(x+3)}{(x-3)(x+2)^2}}$

Simplify each expression.

8. $\dfrac{2x}{x^2-2x-3}-\dfrac{3}{4x+4}$

Simplify each expression.

9. $\dfrac{1}{u^2-u}-\dfrac{1}{u^2-4}$

Simplify each expression.

10. $(x-y)^{-1}-(x+y)^{-1}$

Simplify each expression.

11. $\dfrac{1}{a^2+2a+1} - \dfrac{1}{a^2-1}$

A **complex fraction** is a fraction that has a fraction in its numerator or denominator or in both its numerator and denominator.

Examples: $\dfrac{\dfrac{1}{x}}{y}$; $\dfrac{3}{1-\dfrac{1}{2y}}$; $\dfrac{\dfrac{x-2}{x}-\dfrac{2}{x+1}}{\dfrac{3}{x-1}-\dfrac{1}{x+1}}$

Simplify each complex fraction.

12. $$\frac{\frac{1}{x}+\frac{1}{y}}{\frac{2}{y}-\frac{1}{x}}$$

Simplify each complex fraction.

13. $\dfrac{\frac{1}{x}}{y}$

Simplify each complex fraction.

14. $\dfrac{3}{1-\dfrac{1}{2y}}$

Simplify each complex fraction.

15. $$\frac{\frac{x-2}{x}-\frac{2}{x+1}}{\frac{3}{x-1}-\frac{1}{x+1}}$$

Simplify each complex fraction.

$$\frac{\frac{1}{xy}-\frac{1}{y^2}}{\frac{1}{x^2y}-\frac{1}{xy^2}}$$

Simplify the expression.

16. $\dfrac{-2}{3x^2+36x+105} - \dfrac{3x}{6x+30}$

Simplify the expression.

17. $\dfrac{x}{3x^2-9x+6}-\dfrac{2x+1}{3x^2+3x-6}$