Unit 3 L3. REVIEW Lessons 1 & 2 Rational Expressions Operations Key

Simplify each rational expression.

1. $\frac{x^2-8x+7}{x^2+6x-7}$

$\frac{(x-7)(x-1)}{(x+7)(x-1)}$

$= \frac{x-7}{x+7}, \quad x \neq -7, 1$

2. $\frac{9x^2+12x+4}{9x^2-4}$

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

$= \frac{3x+2}{3x-2} \quad x \neq -\frac{2}{3}, \frac{2}{3}$

3. $\frac{4x^4}{9x} \cdot \frac{9x^3}{10x} \cdot \frac{15x^2}{2x}$

$\frac{4 \cdot 9 \cdot 15 \, x^9}{9 \cdot 10 \cdot 2 \, x^3}$

$= 3x^6 \quad x \neq 0$

4. $\frac{x-y}{w+n} \cdot \frac{w^2-n^2}{y-x}$

$\frac{(x-y)}{(w+n)} \cdot \frac{(w+n)(w-n)}{-1(x-y)}$

$= \frac{w-n}{-1}$

$= -w+n$

5. $\frac{x^2-5x-24}{6x+2x^2} \cdot \frac{5x^2}{8-x}$

$\frac{(x-8)(x+3)}{2x(3+x)} \cdot \frac{5 \cdot x \cdot x}{-1(x-8)}$

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

6. $\frac{2x-3}{5x+1} \div \frac{6x^2-13x+6}{15x^2-7x-2}$

$\frac{(5x+1)(3x-2)}{(3+x)(2x-3)} \cdot \frac{(2x-3)}{(2x+1)(5x-1)}$

$= \frac{3-x}{5x-1}$

7. $\frac{4x-8}{x^2-x-6} \div \frac{x^3+x^2-6x}{x^2-9}$

$\frac{4(x-2)}{(x-3)(x+2)} \cdot \frac{(x+3)(x-3)}{x(x^2+x-6)}$

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

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

8. $\frac{\frac{x^4-81}{3x^2+27}}{\frac{x^2-x-12}{x}}$

$\frac{(x^2-9)(x^2+9)}{3(x^2+9)} \div \frac{(x-4)(x+3)}{x}$

$= \frac{(x+3)(x-3)}{3} \cdot \frac{x}{(x-4)(x+3)}$

$= \frac{x(x-3)}{3(x-4)}$

9. $\frac{x-6}{x+2} \div \frac{\frac{2x-1}{x-6}}{\frac{x-2}{x+2}}$ ← ÷ by

$\frac{x-6}{x+2} \cdot \frac{2x-1}{x-6} \cdot \frac{x+2}{x-2}$

$= \frac{2x-1}{x-2}$

10. $\dfrac{\frac{x^2-5x+6}{x^2-8x+15}}{\frac{x-2}{x-5}} \div \dfrac{x^2-9}{x^2+3x}$

$\dfrac{(x-3)(x-2)}{(x-5)(x-3)} \div \dfrac{(x-2)}{(x-5)}$

$\left(\dfrac{x-2}{x-5}\right)\cdot\left(\dfrac{x-5}{x-2}\right) = 1$

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

11. $\dfrac{x-2}{x+3} + \dfrac{x+3}{x-2}\left(\dfrac{x+3}{x+3}\right)$

$= \dfrac{x^2-4x+4 + x^2+6x+9}{\text{den}}$

$= \dfrac{2x^2+2x+13}{(x-2)(x+3)}$

12. $\dfrac{2-5m}{m-9} + \dfrac{4m-5}{9-m}$ $\quad -1(m-9)$

$\dfrac{2-5m-(4m-5)}{m-9}$

$\dfrac{-9m+7}{m-9}$

13. $\dfrac{x-2}{x+8} - \dfrac{x-2}{x^2+6x-16}$ $\quad \left(\dfrac{x-2}{x-2}\right)$

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

$= \dfrac{x^2-5x+6}{(x+8)(x-2)}$

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

14. $\dfrac{\frac{1}{x}+2}{\frac{4}{x}-1}$

$\dfrac{1+2x}{x} \div \dfrac{4-x}{x}$

$\dfrac{1+2x}{x} \cdot \dfrac{x}{4-x}$

$\dfrac{2x+1}{4-x}$

15. $\dfrac{\frac{x}{x-6}}{\frac{2x-1}{x-6}} - \dfrac{3}{2x-1}$

$= \dfrac{x}{x-6} \cdot \dfrac{x-6}{2x-1} - \dfrac{3}{2x-1}$

$= \dfrac{x}{2x-1} - \dfrac{3}{2x-1}$

$= \dfrac{x-3}{2x-1}$

16. $\dfrac{\frac{10}{3x+1}}{\frac{5x}{3x+1}} + \dfrac{x^2+1}{x}$

$= \dfrac{2}{10} \cdot \dfrac{3x+1}{5x} + \dfrac{x^2+1}{x}$

$\dfrac{2}{x} + \dfrac{x^2+1}{x}$

$= \dfrac{x^2+3}{x}$

17. $\dfrac{x+1}{x-2} + \dfrac{x+2}{x-4} + \dfrac{16-5x}{x^2-6x+8}$ $\quad (x-4)(x-2)$

$= \dfrac{(x+1)(x-4) + (x+2)(x-2) + 16-5x}{\text{den}}$

$= \dfrac{x^2-3x-4 + x^2-4 + 16-5x}{\text{den}}$

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

$= \dfrac{2(x-2)(x-2)}{(x-4)(x-2)}$

18. $\dfrac{5x}{x^2-9} - \dfrac{4}{x+3} + \dfrac{2}{3-x}$ $\quad -1(x-3)$ see below

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

$= 5x-4x+12-2x-6$

$= \dfrac{-1x+6}{x^2-9}$