

Helpful Hint

Always simplify the sum or difference of rational expressions. A rational expression can be simplified if its numerator and denominator contain the same factor.

Add. Identify any x -values for which the expression is undefined.

$$\begin{aligned} \mathbf{B} \quad & \frac{x}{x+3} + \frac{-18}{x^2-9} \\ & \frac{x}{x+3} + \frac{-18}{(x+3)(x-3)} && \text{Factor the denominators.} \\ & \frac{x}{x+3} \left(\frac{x-3}{x-3} \right) + \frac{-18}{(x+3)(x-3)} && \text{The LCD is } (x+3)(x-3), \text{ so} \\ & && \text{multiply } \frac{x}{x+3} \text{ by } \frac{x-3}{x-3}. \\ & \frac{x(x-3) + (-18)}{(x+3)(x-3)} && \text{Add the numerators.} \\ & \frac{x^2 - 3x - 18}{(x+3)(x-3)} && \text{Write the numerator in standard} \\ & && \text{form.} \\ & \frac{\cancel{(x+3)}(x-6)}{\cancel{(x+3)}(x-3)} && \text{Factor the numerator.} \\ & \frac{x-6}{x-3} && \text{Divide out common factors.} \end{aligned}$$

The expression is undefined at $x = -3$ and $x = 3$ because these values of x make the factors $(x + 3)$ and $(x - 3)$ equal 0.



Add. Identify any x -values for which the expression is undefined.

$$\mathbf{3a.} \quad \frac{3x}{2x-2} + \frac{3x-2}{3x-3} \qquad \mathbf{3b.} \quad \frac{x}{x+3} + \frac{2x+6}{x^2+6x+9}$$

COMMON
CORE GPS

EXAMPLE

MCC9-12.A.APR.7(+)

4

Subtracting Rational Expressions

Subtract $\frac{2x^2-16}{x^2-4} - \frac{x+4}{x+2}$. Identify any x -values for which the expression is undefined.

$$\begin{aligned} & \frac{2x^2-16}{(x-2)(x+2)} - \frac{x+4}{x+2} && \text{Factor the denominators.} \\ & \frac{2x^2-16}{(x-2)(x+2)} - \frac{x+4}{x+2} \left(\frac{x-2}{x-2} \right) && \text{The LCD is } (x-2)(x+2), \text{ so} \\ & && \text{multiply } \frac{x+4}{x+2} \text{ by } \frac{x-2}{x-2}. \\ & \frac{2x^2-16 - (x+4)(x-2)}{(x-2)(x+2)} && \text{Subtract the numerators.} \\ & \frac{2x^2-16 - (x^2+2x-8)}{(x-2)(x+2)} && \text{Multiply the binomials in the} \\ & && \text{numerator.} \\ & \frac{2x^2-16 - x^2 - 2x + 8}{(x-2)(x+2)} && \text{Distribute the negative sign.} \\ & \frac{x^2-2x-8}{(x-2)(x+2)} && \text{Write the numerator in standard form.} \\ & \frac{(x-4)\cancel{(x+2)}}{(x-2)\cancel{(x+2)}} && \text{Factor the numerator.} \\ & \frac{x-4}{x-2} && \text{Divide out common factors.} \end{aligned}$$

The expression is undefined at $x = 2$ and $x = -2$ because these values of x make the factors $(x - 2)$ and $(x + 2)$ equal 0.



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