EXAMPLE 3 Add expressions with different denominators

Find the sum $\frac{9}{8x^2} + \frac{5}{12x^3}$.

$$\frac{9}{8x^2} + \frac{5}{12x^3} = \frac{9 \cdot 3x}{8x^2 \cdot 3x} + \frac{5 \cdot 2}{12x^3 \cdot 2}$$ Rewrite fractions using LCD, $24x^3$.

$$= \frac{27x}{24x^3} + \frac{10}{24x^3}$$ Simplify numerators and denominators.

$$= \frac{27x + 10}{24x^3}$$ Add fractions.

EXAMPLE 4 Subtract expressions with different denominators

Find the difference $\frac{10}{3x} - \frac{7x}{x+2}$.

$$\frac{10}{3x} - \frac{7x}{x+2} = \frac{10(x+2)}{3x(x+2)} - \frac{7x(3x)}{(x+2)(3x)}$$ Rewrite fractions using LCD, $3x(x+2)$.

$$= \frac{10(x+2) - 7x(3x)}{3x(x+2)}$$ Subtract fractions.

$$= \frac{-21x^2 + 10x + 20}{3x(x+2)}$$ Simplify numerator.

EXAMPLE 5 Subtract expressions with different denominators

Find the difference $\frac{x+4}{x^2+3x-10} - \frac{x-1}{x^2+2x-8}$.

$$\frac{x+4}{x^2+3x-10} - \frac{x-1}{x^2+2x-8}$$

$$= \frac{x+4}{(x-2)(x+5)} - \frac{x-1}{(x+4)(x-2)}$$ Factor denominators.

$$= \frac{(x+4)(x+4)}{(x-2)(x+5)(x+4)} - \frac{(x-1)(x+5)}{(x+4)(x-2)(x+5)}$$ Rewrite fractions using LCD, $(x-2)(x+5)(x+4)$.

$$= \frac{(x+4)(x+4) - (x-1)(x+5)}{(x-2)(x+5)(x+4)}$$ Subtract fractions.

$$= \frac{x^2 + 8x + 16 - (x^2 + 4x - 5)}{(x-2)(x+5)(x+4)}$$ Find products in numerator.

$$= \frac{4x + 21}{(x-2)(x+5)(x+4)}$$ Simplify.

AVOID ERRORS
Because you are subtracting $x^2 + 4x - 5$ in the numerator, you need to add the opposite of *every* term in $x^2 + 4x - 5$.

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GUIDED PRACTICE for Examples 3, 4, and 5

Find the sum or difference.

6. $\frac{3}{2x} + \frac{7}{5x^4}$ **7.** $\frac{y}{y+1} + \frac{3}{y+2}$ **8.** $\frac{2z-1}{z^2+2z-8} - \frac{z+1}{z^2-4}$