DIVIDING RATIONAL EXPRESSIONS To divide by a rational expression, multiply by its multiplicative inverse.

EXAMPLE 4   **Divide rational expressions involving polynomials**

Find the quotient $\dfrac{7x^2 - 7x}{x^2 + 2x - 3} \div \dfrac{x + 1}{x^2 - 7x - 8}$.

$$\frac{7x^2 - 7x}{x^2 + 2x - 3} \div \frac{x + 1}{x^2 - 7x - 8}$$

$$= \frac{7x^2 - 7x}{x^2 + 2x - 3} \cdot \frac{x^2 - 7x - 8}{x + 1}$$ **Multiply by multiplicative inverse.**

$$= \frac{(7x^2 - 7x)(x^2 - 7x - 8)}{(x^2 + 2x - 3)(x + 1)}$$ **Multiply numerators and denominators.**

$$= \frac{7x(x - 1)(x - 8)(x + 1)}{(x + 3)(x - 1)(x + 1)}$$ **Factor and divide out common factors.**

$$= \frac{7x(x - 8)}{x + 3}$$ **Simplify.**

DIVIDING BY A POLYNOMIAL When you divide a rational expression by a polynomial, first write the polynomial as a fraction with a denominator of 1. Then multiply by the multiplicative inverse of the polynomial.

EXAMPLE 5   **Divide a rational expression by a polynomial**

Find the quotient $\dfrac{2x^2 + 16x + 24}{3x^2} \div (x + 6)$.

$$\frac{2x^2 + 16x + 24}{3x^2} \div (x + 6)$$

$$= \frac{2x^2 + 16x + 24}{3x^2} \div \frac{x + 6}{1}$$ **Rewrite polynomial as fraction.**

$$= \frac{2x^2 + 16x + 24}{3x^2} \cdot \frac{1}{x + 6}$$ **Multiply by multiplicative inverse.**

$$= \frac{2x^2 + 16x + 24}{3x^2(x + 6)}$$ **Multiply numerators and denominators.**

$$= \frac{2(x + 2)(x + 6)}{3x^2(x + 6)}$$ **Factor and divide out common factor.**

$$= \frac{2(x + 2)}{3x^2}$$ **Simplify.**

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✓ **GUIDED PRACTICE**   for Examples 4 and 5

Find the quotient.

5. $\dfrac{m^2 - 4}{2m^2 + 4m} \div \dfrac{6m - 3m^2}{4m + 44}$

6. $\dfrac{n^2 - 6n + 9}{12n} \div (n - 3)$