EXAMPLE 4 Factor completely

Factor the polynomial completely.

a. $n^2 + 2n - 1$ **b.** $4x^3 - 44x^2 + 96x$ **c.** $50h^4 - 2h^2$

Solution

a. The terms of the polynomial have no common monomial factor. Also, there are no factors of -1 that have a sum of 2. This polynomial cannot be factored.

b. $4x^3 - 44x^2 + 96x = 4x(x^2 - 11x + 24)$ Factor out $4x$.

$= 4x(x - 3)(x - 8)$ Find two negative factors of 24 that have a sum of -11.

c. $50h^4 - 2h^2 = 2h^2(25h^2 - 1)$ Factor out $2h^2$.

$= 2h^2(5h - 1)(5h + 1)$ Difference of two squares pattern

GUIDED PRACTICE for Example 4

Factor the polynomial completely.

4. $3x^3 - 12x$ **5.** $2y^3 - 12y^2 + 18y$ **6.** $m^3 - 2m^2 - 8m$

EXAMPLE 5 Solve a polynomial equation

Solve $3x^3 + 18x^2 = -24x$.

$3x^3 + 18x^2 = -24x$ Write original equation.

$3x^3 + 18x^2 + 24x = 0$ Add $24x$ to each side.

$3x(x^2 + 6x + 8) = 0$ Factor out $3x$.

$3x(x + 2)(x + 4) = 0$ Factor trinomial.

$3x = 0$ *or* $x + 2 = 0$ *or* $x + 4 = 0$ Zero-product property

$x = 0$ $x = -2$ $x = -4$ Solve for x.

▶ The solutions of the equation are 0, -2, and -4.

CHECK Check each solution by substituting it for x in the equation. One check is shown here.

$3(-2)^3 + 18(-2)^2 \stackrel{?}{=} -24(-2)$

$-24 + 72 \stackrel{?}{=} 48$

$48 = 48$ ✓

GUIDED PRACTICE for Example 5

Solve the equation.

7. $w^3 - 8w^2 + 16w = 0$ **8.** $x^3 - 25x = 0$ **9.** $c^3 - 7c^2 + 12c = 0$