QUADRATIC FORM An expression of the form $au^2 + bu + c$, where u is any expression in x, is said to be in **quadratic form**. The factoring techniques you studied in Chapter 4 can sometimes be used to factor such expressions.

EXAMPLE 4 Factor polynomials in quadratic form

IDENTIFY QUADRATIC FORM
The expression $16x^4 - 81$ is in quadratic form because it can be written as $u^2 - 81$ where $u = 4x^2$.

Factor completely: (a) $16x^4 - 81$ and (b) $2p^8 + 10p^5 + 12p^2$.

a. $16x^4 - 81 = (4x^2)^2 - 9^2$ — Write as difference of two squares.

$= (4x^2 + 9)(4x^2 - 9)$ — Difference of two squares

$= (4x^2 + 9)(2x + 3)(2x - 3)$ — Difference of two squares

b. $2p^8 + 10p^5 + 12p^2 = 2p^2(p^6 + 5p^3 + 6)$ — Factor common monomial.

$= 2p^2(p^3 + 3)(p^3 + 2)$ — Factor trinomial in quadratic form.

✓ GUIDED PRACTICE for Examples 3 and 4

Factor the polynomial completely.

5. $x^3 + 7x^2 - 9x - 63$ **6.** $16g^4 - 625$ **7.** $4t^6 - 20t^4 + 24t^2$

SOLVING POLYNOMIAL EQUATIONS In Chapter 4, you learned how to use the zero product property to solve factorable quadratic equations. You can extend this technique to solve some higher-degree polynomial equations.

TAKS EXAMPLE 5 TAKS PRACTICE: Multiple Choice

What are the real-number solutions of the equation $4x^5 + 216x = 60x^3$?

Ⓐ 0, 2, 3, 6 Ⓑ $-3, 0, 3$

Ⓒ $0, \sqrt{6}, 3$ Ⓓ $-3, -\sqrt{6}, 0, \sqrt{6}, 3$

Solution

$4x^5 + 216x = 60x^3$ — Write original equation.

$4x^5 - 60x^3 + 216x = 0$ — Write in standard form.

$4x(x^4 - 15x^2 + 54) = 0$ — Factor common monomial.

$4x(x^2 - 9)(x^2 - 6) = 0$ — Factor trinomial.

$4x(x + 3)(x - 3)(x^2 - 6) = 0$ — Difference of two squares

$x = 0, x = -3, x = 3, x = \sqrt{6}$, or $x = -\sqrt{6}$ — Zero product property

AVOID ERRORS
Do not divide each side of an equation by a variable or a variable expression, such as $4x$. Doing so will result in the loss of solutions.

▶ The correct answer is D. Ⓐ Ⓑ Ⓒ Ⓓ

✓ GUIDED PRACTICE for Example 5

Find the real-number solutions of the equation.

8. $4x^5 - 40x^3 + 36x = 0$ **9.** $2x^5 + 24x = 14x^3$ **10.** $-27x^3 + 15x^2 = -6x^4$