Factor the expression.

1. $x^3 - 6x^2 + 12x - 8$

2. $x^3 + 18x^2 + 108x + 216$

3. $8x^3 - 12x^2 + 6x - 1$

4. $27x^3 + 27x^2 + 9x + 1$

5. $x^3 + 30x^2 + 300x + 1000$

6. $729x^3 - 486x^2 + 108x - 8$

Match the polynomial with the appropriate factorization.

7. $32x^2 - 24x^2 + 6x - \frac{1}{2}$

   A. $\frac{1}{2}(x - 4)^3$

8. $\frac{1}{2}x^3 + 6x^2 + 24x + 32$

   B. $\frac{1}{2}(4x - 1)^3$

9. $\frac{1}{2}x^3 - 6x^2 + 24x - 32$

   C. $\frac{1}{2}(x + 4)^3$

10. **Multiple Choice** Which expression is equivalent to $125x^3 - 225x^2 + 135x - 27$?

    A. $(3x - 5)^3$ B. $(5x - 3)^3$ C. $(3x + 5)^3$ D. $(5x + 3)^3$

Factor the expression.

11. $x^3y^3 + 3x^2y^2 + 3xy + 1$

12. $m^3n^3 - 9m^2n^2 + 27mn - 27$

13. $27x^3 - 54x^2y + 36xy^2 - 8y^3$

14. $64x^3 + 240x^2y + 300xy^2 + 125y^3$

15. **Error Analysis** *Describe* and correct the student's error in factoring
    $a^3b^3 - 3a^2b^2cd + 3abc^2d^2 - c^3d^3$.

    $$a^3b^3 - 3a^2b^2cd + 3abc^2d^2 - c^3d^3 = (ab)^3 - 3(ab)^2(cd) + 3(ab)(cd)^2 - (cd)^3$$
    $$= (ab + cd)^3$$

    ✗

16. **Geometry** The diagram at the right shows a cube shaped tissue box and an expression for its volume.

    a. Find a binomial that represents an edge length of the tissue box.

    b. Write an expression for the surface area of the tissue box.

    c. If x is 4 centimeters, what is the surface area of the tissue box?

    Volume:
    $27x^3 - 27x^2 + 9x - 1$

UNIT 3

LESSON 3.2

Exercise Set B

MM1A2f Factor expressions by greatest common factor, grouping, trial and error, and special products.

Factor the expression.

1. $a^3 + 9a^2 + 27a + 27$

2. $125 - 75y + 15y^2 - y^3$

3. $2 - 12y + 24y^2 - 16y^3$

4. $2x^4 + 30x^3 + 150x^2 + 250x$

5. **Reasoning** Adrianna and Lauren factor the expression $8w^3 - 6w^2 + \frac{3}{2}w - \frac{1}{8}$.

Adrianna's answer is $\left(2w - \frac{1}{2}\right)^3$ and Lauren's answer is $\frac{1}{8}(4w - 1)^3$. Who is correct?

Explain.

Factor the expression.

6. $s^3t^3 + 6s^2t^2 + 12st + 8$

7. $1 - 3gh + 3g^2h^2 - g^3h^3$

8. $x^3 - 9x^2y + 27xy^2 - 27y^3$

9. $512x^3 + 960x^2y + 600xy^2 + 125y^3$

Determine the value of k for which the expression can be factored using a special product pattern.

10. $x^3 + 6x^2 + kx + 8$

11. $64z^3 - kz^2 + 108z - 27$

12. $kx^3y^3 - 12x^2y^2z + 6xyz^2 - z^3$

13. $\frac{1}{8}x^3 + 6x^2 + kx + 512$

Complete the statement with $+$, $-$, $\cdot$, or $=$.

14. $(x - y)^3$ __?__ $(y - x)^3$ __?__ (-1)

15. $(x + y)^3$ __?__ $(x - y)^3$ __?__ $6x^2y$ __?__ $2y^3$

16. **Savings** You have a savings account like the one described in Example 3 on page 131. The polynomial $900 + 2700r + 2700r^2 + 900r^3$ represents the amount of money in the account after 3 years.

a. What was the initial amount of your investment?

b. If $r = 0.03$, what is the amount in the savings account after 3 years to the nearest cent?

17. **Packaging** You are shipping a cube-shaped package. The volume of the package can be represented by the polynomial $8x^3 - 12x^2 + 6x - 1$. The area A of one of the faces of a larger cube-shaped package is shown at the right. How much longer is an edge length of the larger package?

$A = 16x^2 - 16x + 4$

UNIT 3