15-2 Adding Polynomials

Objective: To add polynomials.

CONNECTION

In previous chapters you performed the four basic operations with rational numbers. You can also add, subtract, multiply, and divide polynomials.

Example 2 Add: $(6x^4 - 2x^3 + 7x^2 + x - 6) + (-7x^4 + 2x^3 - 5x + 7)$

Solution 1 Line up like terms vertically.

$$\begin{array}{r} 6x^4 - 2x^3 + 7x^2 + x - 6 \\ -7x^4 + 2x^3 + 0x^2 - 5x + 7 \\ \hline -1x^4 + 0x^3 + 7x^2 - 4x + 1 \end{array}$$

← Insert $0x^2$ since there is no x^2 term.

The sum is written $-x^4 + 7x^2 - 4x + 1$.

Solution 2

$$\begin{aligned} &(6x^4 - 2x^3 + 7x^2 + x - 6) + (-7x^4 + 2x^3 - 5x + 7) \\ &= (6x^4 - 7x^4) + (-2x^3 + 2x^3) + 7x^2 + (x - 5x) + (-6 + 7) \\ &= -1x^4 + 0x^3 + 7x^2 + (-4x) + 1 \\ &= -x^4 + 7x^2 - 4x + 1 \end{aligned}$$

Check Your Understanding

1. In Solution 2, why does $x + (-5x) = -4x$?
2. In Solutions 1 and 2, why is there no x^3 term in the answer?

Generalization: Adding Polynomials

To add polynomials, combine like terms.

When adding polynomials, insert a zero term for a missing power.

Guided Practice 15-2

Replace each ? with the term that makes the statement true.

5. $(5x^2 + 3x + 2) + (2x^2 + 6x + 6)$
   $= 7x^2 + \underline{?} + 8$

6. $(3a^3 + 4a^2 - 5a + 1) + (5a^3 - a^2 - 2a + 3)$
   $= 8a^3 + \underline{?} - \underline{?} + 4$

7. $(-c^4 + 2c^3 + 7c) + (2c^4 + c^3 - 5c^2 + 2c)$
   $= \underline{?} + 3c^3 - \underline{?} + 9c$

8. $(3m^3 - m^2 + 5m + 2) + (m^3 + m^2 - 3m + 6)$
   $= 4m^3 + \underline{?} + 8$

Add.

9. $2x^2 + 3x + 4$
   $5x^2 - 4x - 3$

10. $y^2 + 8y - 2$
    $7y^2 - 5y + 8$

11. $-3c^3 - 5c^2 - 11c - 5$
    $2c^3 - 6c^2 + 9c - 7$

12. $z^4 - z^3 - 2z^2 - 3z$
    $4z^4 + 5z^2 + 2z - 1$

13. $(6c^3 + 8c^2 - 12c - 4) + (9c^3 + c^2 + 3c + 7)$

14. $(8w^3 - 9w^2 - 6w + 9) + (5w^3 - 3w^2 - 8w - 11)$

15. $(z^5 - 2z^3 - 9z + 3) + (-z^4 + 2z^3 - 10)$

16. $(-6r^4 + 4r^2 + 1) + (-5r^2 - 7r + 4)$