

## 5-5 Differences of Two Squares

**Objective:** To simplify products of the form  $(a + b)(a - b)$  and to factor differences of two squares.

### Vocabulary

#### Product of the Sum and Difference of Two Numbers

$$(a + b)(a - b) = a^2 - ab + ab - b^2 = a^2 - b^2$$

#### Difference of Two Squares

$$a^2 - b^2 = (a + b)(a - b)$$

**Example 1** Write each product as a binomial.

a.  $(x + 2)(x - 2)$     b.  $(2n + 3)(2n - 3)$

**Solution** These products fit the form  $(a + b)(a - b)$ , so each binomial is of the form  $a^2 - b^2$ .

$$\begin{aligned} \text{a. } (x + 2)(x - 2) &= (x)^2 - (2)^2 \\ &= x^2 - 4 \end{aligned}$$

$$\begin{aligned} \text{b. } (2n + 3)(2n - 3) &= (2n)^2 - (3)^2 \\ &= 4n^2 - 9 \end{aligned}$$

Write each product as a binomial.

1.  $(a + 3)(a - 3)$

2.  $(4 - x)(4 + x)$

3.  $(x + 5)(x - 5)$

4.  $(9 - x)(9 + x)$

5.  $(5a + 2)(5a - 2)$

6.  $(7a - 2)(7a + 2)$

7.  $(4 + 3x)(4 - 3x)$

8.  $(6 - 5x)(6 + 5x)$

9.  $(3 - 5x)(3 + 5x)$

10.  $(8x + 7)(8x - 7)$

**Example 2** Write each product as a binomial.

a.  $(a^2 - 3b)(a^2 + 3b)$     b.  $(xy + z)(xy - z)$

**Solution** These products fit the form  $(a + b)(a - b)$ , so each binomial is of the form  $a^2 - b^2$ .

$$\begin{aligned} \text{a. } (a^2 - 3b)(a^2 + 3b) &= (a^2)^2 - (3b)^2 \\ &= a^4 - 9b^2 \end{aligned}$$

$$\begin{aligned} \text{b. } (xy + z)(xy - z) &= (xy)^2 - z^2 \\ &= x^2y^2 - z^2 \end{aligned}$$

Write each product as a binomial.

11.  $(3x + 4y)(3x - 4y)$

12.  $(2u + v)(2u - v)$

13.  $(x^2 - 8y)(x^2 + 8y)$

14.  $(x^2 - 3y^2)(x^2 + 3y^2)$

15.  $(2a^2 + 5b^2)(2a^2 - 5b^2)$

16.  $(ab - 2c)(ab + 2c)$

**5-5 Differences of Two Squares** (continued)**Example 3** Multiply. Use the pattern  $(a + b)(a - b) = a^2 - b^2$ .

a.  $58 \cdot 62$

b.  $93 \cdot 87$

**Solution**

$\begin{aligned} \text{a. } 58 \cdot 62 &= (60 - 2)(60 + 2) \\ &= 3600 - 4 \\ &= 3596 \end{aligned}$	$\begin{aligned} \text{b. } 93 \cdot 87 &= (90 + 3)(90 - 3) \\ &= 8100 - 9 \\ &= 8091 \end{aligned}$
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Multiply. Use the pattern  $(a + b)(a - b) = a^2 - b^2$ .

17.  $16 \cdot 24$

18.  $27 \cdot 33$

19.  $53 \cdot 47$

20.  $35 \cdot 45$

21.  $41 \cdot 39$

22.  $92 \cdot 88$

23.  $104 \cdot 96$

24.  $60 \cdot 140$

**Example 4** Factor: a.  $a^2 - 16$     b.  $9 - 4b^2$     c.  $25a^2 - 36x^6$ **Solution** Use the pattern  $a^2 - b^2 = (a + b)(a - b)$ 

$$\begin{aligned} \text{a. } a^2 - 16 &= a^2 - 4^2 \\ &= (a + 4)(a - 4) \end{aligned}$$

$$\begin{aligned} \text{b. } 9 - 4b^2 &= 3^2 - (2b)^2 \\ &= (3 + 2b)(3 - 2b) \end{aligned}$$

$$\begin{aligned} \text{c. } 25a^2 - 36x^6 &= (5a)^2 - (6x^3)^2 \\ &= (5a + 6x^3)(5a - 6x^3) \end{aligned}$$

**Factor.** You may use a calculator or a table of squares.

25.  $b^2 - 16$

26.  $f^2 - 81$

27.  $36 - x^2$

28.  $9e^2 - 16$

29.  $49n^2 - 1$

30.  $4a^2 - 9$

31.  $a^4 - 36$

32.  $49b^2 - 16c^2$

33.  $100 - 121r^2$

34.  $121 - y^2$

35.  $25u^2 - 36$

36.  $16x^2 - 225$

**Mixed Review Exercises**

Simplify.

1.  $5z(z - 2) + 3z(z + 4)$

2.  $(x + 4)(x - 5)$

3.  $-3(m + 2) - 4m(m - 3)$

4.  $\frac{36a^5b^2}{9a^3}$

5.  $\frac{15a + 5}{5}$

6.  $\frac{18n^2x}{6nx}$

7.  $(a + 2)(2a - 1)$

8.  $(3b + 2)(b - 1)$

9.  $(4x)^2\left(\frac{1}{4}\right)^2x$

10.  $\frac{12y^3 + 28y^2 - 8y}{4y}$

11.  $\frac{30x^3 + 45x^2 - 15x}{15x}$

12.  $\frac{24x^3y^4z}{3x^3y^3z}$