

PERFECT SQUARE TRINOMIALS The pattern for finding the square of a binomial gives you the pattern for factoring trinomials of the form $a^2 + 2ab + b^2$ and $a^2 - 2ab + b^2$. These are called **perfect square trinomials**.

KEY CONCEPT

For Your Notebook

Perfect Square Trinomial Pattern

Algebra

Example

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

$$x^2 + 6x + 9 = x^2 + 2(x \cdot 3) + 3^2 = (x + 3)^2$$

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

$$x^2 - 10x + 25 = x^2 - 2(x \cdot 5) + 5^2 = (x - 5)^2$$

EXAMPLE 3 Factor perfect square trinomials

Factor the polynomial.

a. $n^2 - 12n + 36 = n^2 - 2(n \cdot 6) + 6^2$
 $= (n - 6)^2$

Write as $a^2 - 2ab + b^2$.

Perfect square trinomial pattern

b. $9x^2 - 12x + 4 = (3x)^2 - 2(3x \cdot 2) + 2^2$
 $= (3x - 2)^2$

Write as $a^2 - 2ab + b^2$.

Perfect square trinomial pattern

c. $4s^2 + 4st + t^2 = (2s)^2 + 2(2s \cdot t) + t^2$
 $= (2s + t)^2$

Write as $a^2 + 2ab + b^2$.

Perfect square trinomial pattern

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EXAMPLE 4 Factor a perfect square trinomial

Factor the polynomial $-3y^2 + 36y - 108$.

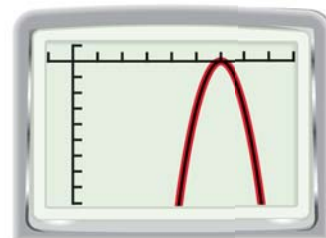
$$\begin{aligned} -3y^2 + 36y - 108 &= -3(y^2 - 12y + 36) \\ &= -3[y^2 - 2(y \cdot 6) + 6^2] \\ &= -3(y - 6)^2 \end{aligned}$$

Factor out -3 .

Write $y^2 - 12y + 36$ as $a^2 - 2ab + b^2$.

Perfect square trinomial pattern

CHECK Check your factorization using a graphing calculator. Graph $y_1 = -3x^2 + 36x - 108$ and $y_2 = -3(x - 6)^2$. Because the graphs coincide, you know that your factorization is correct.



 **GUIDED PRACTICE** for Examples 3 and 4

Factor the polynomial.

2. $h^2 + 4h + 4$

3. $2y^2 - 20y + 50$

4. $3x^2 + 6xy + 3y^2$