

Quadratics & Polynomials

10th Grade

Completing the square, vertex form, factoring patterns and end behaviour.

COMPLETING THE SQUARE

$$x^2 + 6x + 5 = 0$$

1. Move the constant: $x^2 + 6x = -5$

2. Add $(b/2)^2 = 9$ to both sides: $x^2 + 6x + 9 = 4$

3. Factor: $(x + 3)^2 = 4 \rightarrow x + 3 = \pm 2 \rightarrow x = -1 \text{ or } -5$

VERTEX FORM

$$y = a(x - h)^2 + k \rightarrow \text{vertex } (h, k)$$

$a > 0$ opens up (minimum). $a < 0$ opens down (maximum).

From standard form, the axis of symmetry is $x = -b / 2a$. Substitute to get k .

FACTORING PATTERNS

Difference of squares

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

$$x^2 - 16 = (x+4)(x-4)$$

Perfect square trinomial

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

$$x^2 + 10x + 25 = (x+5)^2$$

Sum of cubes

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$x^3 + 8$$

Difference of cubes

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

$$x^3 - 27$$

Grouping

$$ax + ay + bx + by = (a+b)(x+y)$$

four terms

End behaviour: even degree $\rightarrow$ both ends together. Odd degree $\rightarrow$ ends opposite.

Leading coefficient positive $\rightarrow$ right end rises.