

Equation of a Quadratic in Vertex Form:

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

Example 1:

A parabola has its vertex at $(-2, 1)$ and passes through the point $(1, 28)$. Use the vertex form of the equation of a quadratic to find its equation.

Solution:

Substituting the vertex in the equation above gives:

$$y = a(x + 2)^2 + 1$$

Using the known point $(1, 28)$ allows you to find a :

$$28 = a(1 + 2)^2 + 1$$

$$28 - 1 = 9a$$

$$a = 3$$

Therefore, the final equation is $y = 3(x + 2)^2 + 1$.

Example 2:

Find the vertex of the parabola $y = -2x^2 - 4x + 1$ by changing the equation to vertex form.

Solution:

$$y = -2x^2 - 4x + 1$$

$$= -2(x^2 + 2x) + 1$$

$$= -2(x^2 + 2x + 1) + 1 + 2 \quad (\text{Complete the square in the brackets.})$$

$$= -2(x + 1)^2 + 3$$

Therefore, the vertex is at $(-1, 3)$.