

Parabola vertex form ($a=1$ only)



Vertex Form ($a = 1$)

Key idea

With $a = 1$: $y = (x - h)^2 + k$. Vertex (h, k) , axis $x = h$. The graph always opens upward, with minimum value k .

Reading the graph

For $y = (x - 2)^2 - 3$: vertex $(2, -3)$, axis $x = 2$, minimum value -3 .

Using symmetry

Still $y = (x - 2)^2 - 3$: $y(1) = -2$ and $y(3) = -2$, since 1 and 3 are both one unit from the axis $x = 2$.

Common mistake

Switch the sign inside the bracket. $y = (x + 4)^2 - 1$ has axis $x = -4$, not $x = 4$.



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Solving with Vertex Form



Writing the equation from the vertex

If the turning point is $(4, 1)$, then $h = 4$ and $k = 1$, so $y = (x - 4)^2 + 1$. The axis is $x = 4$.

When roots exist

For $y = (x - 3)^2 - 9$, set $y = 0$:
 $(x - 3)^2 = 9$, so $x - 3 = \pm 3$, giving
 $x = 0$ and $x = 6$.

Common mistake

Not every vertex-form parabola crosses the x -axis. If $k > 0$, the whole graph sits above the x -axis, so there are no real roots.



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