

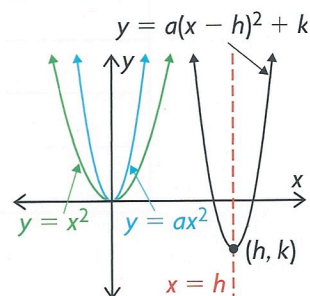
In Summary

Key Idea

- Compared with the graph of $y = x^2$, the graph of $y = a(x - h)^2 + k$ is a parabola that has been stretched or compressed vertically by a factor of a , translated horizontally by h , and translated vertically by k . As well, if $a < 0$, the parabola is reflected in the x -axis.

Need to Know

- The vertex of $y = a(x - h)^2 + k$ has the coordinates (h, k) . The equation of the axis of symmetry of $y = a(x - h)^2 + k$ is $x = h$.
- When sketching the graph of $y = a(x - h)^2 + k$ as a transformation of the graph of $y = x^2$, follow the order of operations for the arithmetic operations to be performed on the coordinates of each point. Apply vertical stretches/compressions and reflections, which involve multiplication, before translations, which involve addition or subtraction.



CHECK Your Understanding

- Describe the transformations you would apply to the graph of $y = x^2$, in the order you would apply them, to obtain the graph of each quadratic relation.
 - $y = x^2 - 3$
 - $y = (x + 5)^2$
 - $y = -\frac{1}{2}x^2$
 - $y = 4(x + 2)^2 - 16$
- For each quadratic relation in question 1, identify
 - the direction in which the parabola opens
 - the coordinates of the vertex
 - the equation of the axis of symmetry
- Sketch the graph of each quadratic relation. Start with a sketch of $y = x^2$, and then apply the appropriate transformations in the correct order.
 - $y = (x + 5)^2 - 4$
 - $y = -0.5x^2 + 8$
 - $y = 2(x - 3)^2$
 - $y = \frac{1}{2}(x - 4)^2 - 2$

PRACTISING

- What transformations would you apply to the graph of $y = x^2$ to create the graph of each relation? List the transformations in the order you would apply them.
 - $y = -x^2 + 9$
 - $y = (x - 3)^2$
 - $y = (x + 2)^2 - 1$
 - $y = -x^2 - 6$