

Quadratic Equations

Three formulas for the Quadratic Questions:

$y=ax^2+bx+c$ - Standard form
$y=a(x-r)(x-s)$ - Factored form
$y=a(x-h)^2+k$ - Vertex Form (see file: Chapter 3_QuadraticRelations.pdf – for details)

$y=ax^2+bx+c$ - Standard form

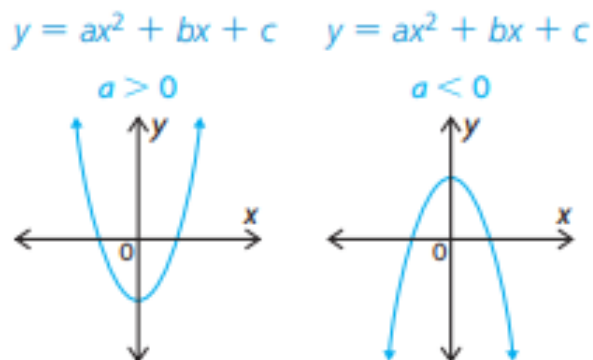
In Summary

Key Ideas

- The graph of any quadratic relation of the form $y = ax^2 + bx + c$, where $a \neq 0$, is a parabola that has a vertical line of symmetry.
- Any relation described by a polynomial of degree 2 is quadratic.

Need to Know

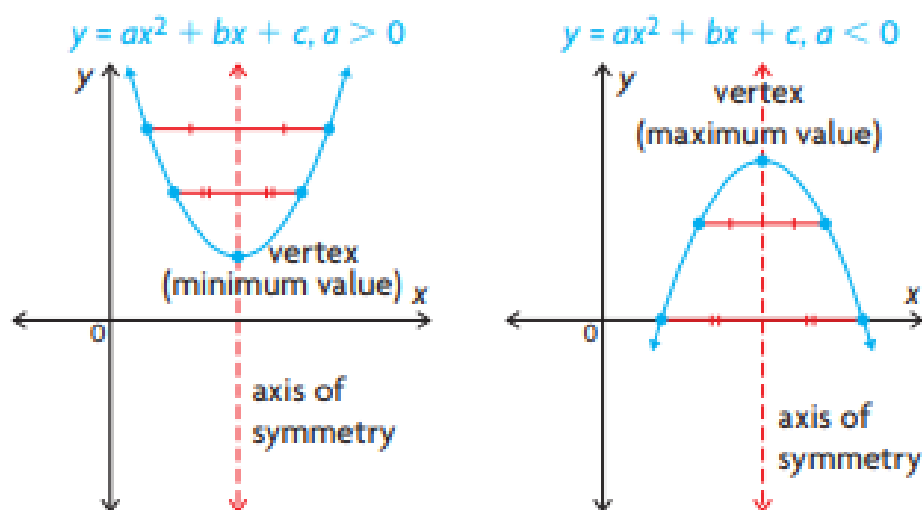
- For the quadratic relation $y = ax^2 + bx + c$,
 - the second differences are constant, but not zero
 - when the value of a (the coefficient of the x^2 term) is positive, the parabola opens upward and the second differences are positive
 - when the value of a (the coefficient of the x^2 term) is negative, the parabola opens downward and the second differences are negative
 - changing the value of b (the coefficient of the x term) changes the location of the line of symmetry of the parabola
 - the constant c is the value of the y -intercept of the parabola



In Summary

Key Ideas

- The vertex of a parabola with equation $y = ax^2 + bx + c$ is the point on the graph with
 - the least y -coordinate, or minimum value, if the parabola opens upward
 - the greatest y -coordinate, or maximum value, if the parabola opens downward



- A parabola with equation $y = ax^2 + bx + c$ is symmetrical with respect to a vertical line through its vertex. This line, or axis of symmetry, is the perpendicular bisector of any line segment that joins two points with the same y -coordinate on the parabola.

Need to Know

- The x -intercepts, or zeros, of a parabola can be determined by setting $y = 0$ in the equation of the parabola and solving for x .
- The y -intercept of a parabola can be determined by setting $x = 0$ in the equation of the parabola and solving for y .
- When a problem can be modelled by a quadratic relation, the graph of the relation can be used to estimate solutions to the problem.

$$y = a(x-r)(x-s) \text{ - Factored form}$$

In Summary

Key Ideas

- When a quadratic relation is expressed in factored form $y = a(x - r)(x - s)$, each factor can be used to determine a zero, or x -intercept, of the parabola.
- An equation for a parabola can be determined using the zeros and the coordinates of one other point on the parabola.

Need to Know

- If a quadratic relation is expressed in the form $y = a(x - r)(x - s)$,
 - the x -intercepts are r and s
 - the equation of the axis of symmetry is the vertical line defined by the equation $x = (r + s) \div 2$
 - the x -coordinate of the vertex is $(r + s) \div 2$
 - the y -intercept is $c = a \times r \times s$

