

Properties of Quadratic Relations

The graph of a quadratic relation is called a parabola.

The Vertex of a parabola is the point on the graph with the greatest y-coordinate if the graph opens down or the least y-coordinate if the graph opens up.

When a quadratic relation is used to model a situation, the y-coordinate of the vertex corresponds to an optimum value.

If the parabola opens up the optimum value is a minimum.

If the parabola opens down the optimum value is a maximum.

The direction of opening of the parabola can be determined from the sign of the second differences in the table of values of the quadratic relation.

If the second differences are positive, then the parabola opens **up**.

If the second differences are negative, then the parabola opens **down**.

A parabola is symmetrical with respect to a vertical line through its vertex. The line is called the axis of symmetry. The vertex lies on the axis of symmetry.

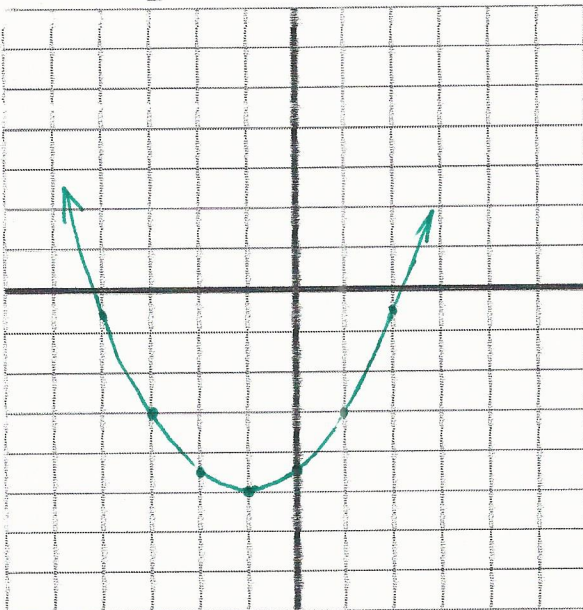
Therefore the equation of the axis of symmetry is of the form $x = x_v$

If the parabola crosses the x-axis, the x coordinates of these points are called the x-intercepts. The vertex is directly above or below the midpoint of the segment joining the zeros. The x-intercepts, also known as zeroes or roots do

not always exist. Yet every (vertical) parabola has a y-intercept.

Examples:

(a) $y = \frac{1}{2}(x+1)^2 - 5$



(b) $y = -2(x-3)^2 + 6$

