

L3 Properties of a Quad Fcn

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Lesson 3 Properties of a Quadratic Function

A **quadratic function** is any function that can be written in the form $y = ax^2 + bx + c$, where a, b and c are real numbers and $a \neq 0$. This is called the **general form** of a quadratic function.

Shape of graph: parabola opening up or down.



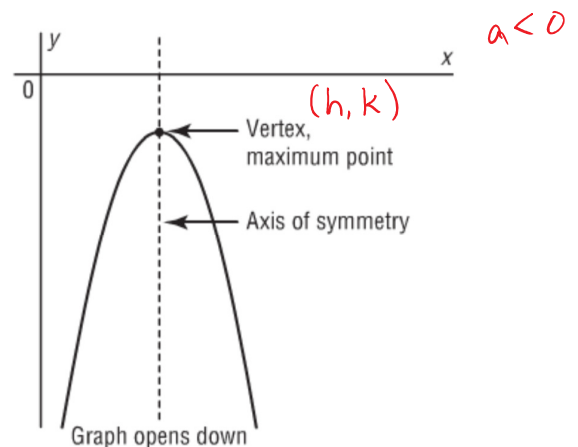
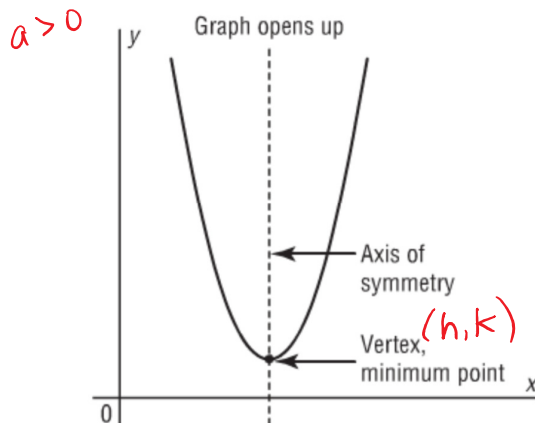
Vertex: highest or lowest point, known as the maximum/minimum point
Coordinates are (h, k) when written in transformational form $y = a(x - h)^2 + k$

Axis of symmetry: the vertical line through the vertex of a parabola, written as $x = h$
The parabola is symmetrical about this line.

Given $y = ax^2$,

if a is positive ($a > 0$), the parabola opens up and its vertex is a minimum point.

if a is negative ($a < 0$) the parabola opens down and its vertex is a maximum point.



Domain: $(-\infty, \infty)$
all values of x

Range: $[k, \infty)$ or $(-\infty, k]$

\swarrow \searrow
y-coordinate of vertex
(max/min value)

The **y-intercept** of a quadratic function is the value of y when $x = 0$.

The **x-intercepts** of the graph of a quadratic function, $y = ax^2 + bx + c$ are called the **zeros of the function** because they are the values of x when the function equals 0 (when $y = 0$).

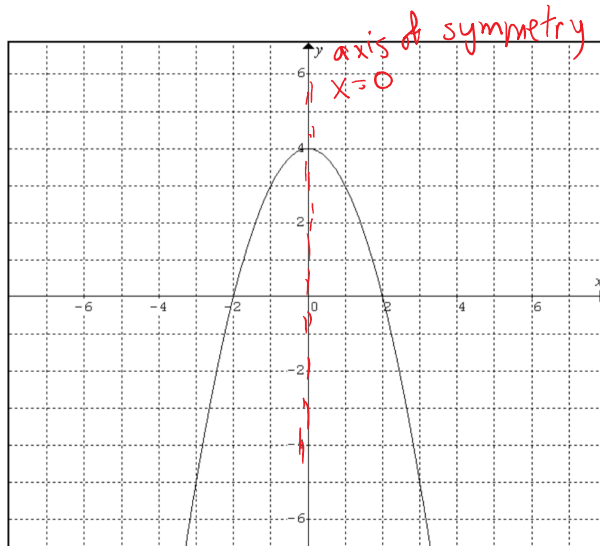
The zeros of the function are the **roots** of the related quadratic equation $ax^2 + bx + c = 0$.

Example 1

a) Given the graph below, identify:

- i) the x- and y- intercepts
- ii) the coordinates of the vertex
- iii) the equation of the axis of symmetry
- iv) the domain of the function
- v) the range of the function
- vi) the maximum/minimum value

x-ints -2, 2 y-int 4
 h k
 $V(0, 4)$
 $x=h$ $x=0$
 $(-\infty, \infty)$
 $(-\infty, 4]$
gr 10 notation
 $x \leq 4$
max@4
 \swarrow k value of vertex



Example 2

b) Given the graph below, identify:

- i) the x- and y- intercepts
- ii) the coordinates of the vertex
- iii) the equation of the axis of symmetry
- iv) the domain of the function
- v) the range of the function
- vi) the maximum/minimum value

x-ints 1,5 y-int 5

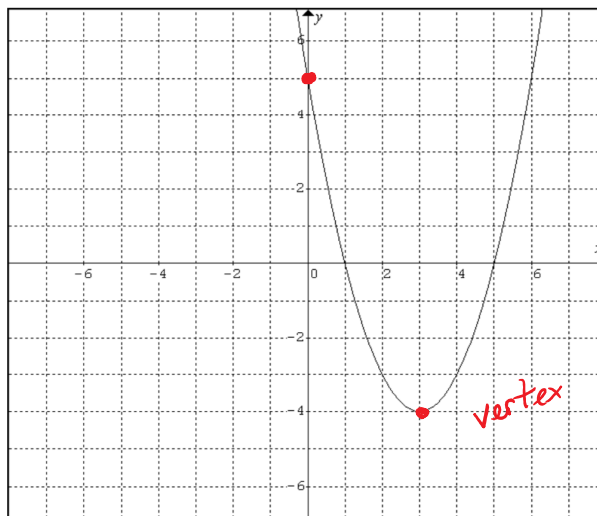
V(3,-4)

x=3

(-∞, ∞)

[-4, ∞)

min@ -4

**Example 3**State the y-intercept of quadratic function, $y = -2x^2 + 5x - 8$.

$x = 0$

$y = -2x^2 + 5x - 8$

$y = -2(0)^2 + 5(0) - 8$

$y = -8$