5.5 The x-intercepts of a Quadratic Relation

A Forms of Quadratic Relations

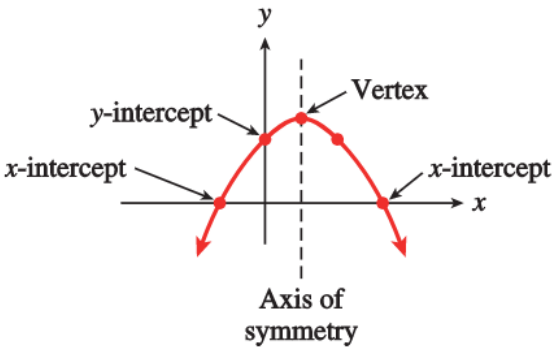
Standard Form	Vertex Form	Factored Form
$y = ax^2 + bx + c$	$y = a(x - h)^2 + k$	$y = a(x - x_1)(x - x_2)$
The y-intercept is: $y - int = c$	The vertex point is: $V(h, k)$	The x-intercepts are: x_1 and x_2

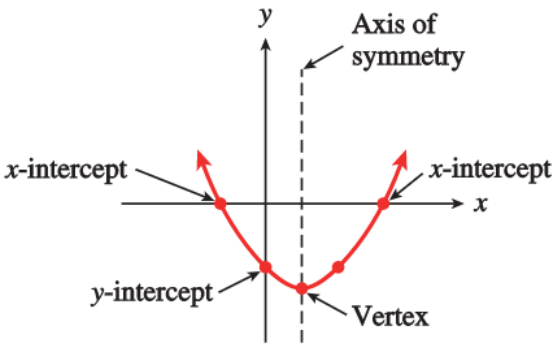
Example 1. Identify the form the following quadratic relations are given.

a) $y = 2(x - 3)^2 + 6$ b) $y = (x - 1)(x + 4)$ c) $y = 2x^2 + 2x - 4$

B Parabola

The graph of a quadratic relation is called *parabola*.





Characteristics:

- ✓ Parabola has a *vertex point*.
- ✓ The *vertex point* is either a *minimum* or a *maximum* point.
- ✓ If $a > 0$, parabola opens *up(ward)*.
- ✓ If $a < 0$, parabola opens *down(ward)*.
- ✓ Parabola is symmetrical with respect to the *axis of symmetry*.
- ✓ The *axis of symmetry* passes through the *vertex point*.

Example 2. For the quadratic relation given graphically below, find

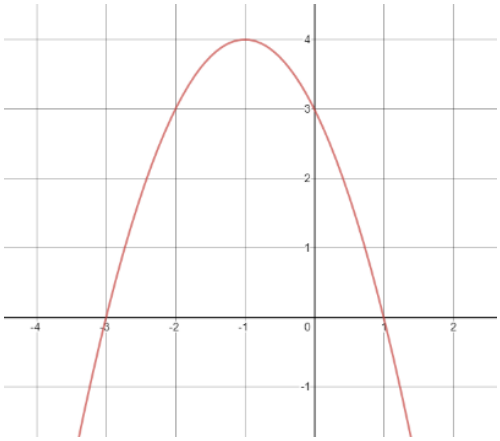
The vertex point:

The y-intercept point:

The x-intercept points:

Direction of opening:

Axis of symmetry:



C Factored Form

The factored form a quadratic relation is:

$$y = a(x - x_1)(x - x_2)$$

where x_1 and x_2 are the x-intercepts or the zeros of the quadratic relation.

Example 3. For each quadratic relation, find the x-intercept points.

a) $y = (x - 2)(x - 3)$

b) $y = (x - 1)(x + 4)$

c) $y = (x - 7)^2$

d) $y = -3x(x - 6)$

Example 4. For each quadratic relation, find the x-intercept points (challenge).

a) $y = x^2 + 5x + 6$

b) $y = 2x^2 - 8x + 6$

c) $y = (x + 1)^2 - 2$

d) $y = 4 - (x - 2)^2$

Example 5. (Application) In a target game at an amusement park, players launch a beanbag toward a bucket using a mallet and a small seesaw. The path of a beanbag that lands directly in the bucket can be modelled by the relation $h = -0.65d^2 + 1.625d$, where h is the beanbag's height above the table and d is the beanbag's distance from the seesaw, both in metres.

a) Find the zeros of the relation.

b) How far is the bucket from the seesaw?

c) Find the beanbag's maximum height above the table to the nearest tenth of a metre.

Notes: Textbook Pages 264-270
Homework: Textbook Pages 271 #1, 3ab, 4ab, 5ab, 7a