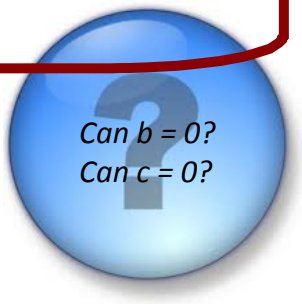
3.2 Quadratic Relations

A **quadratic function**'s equation that can be written in the form $y = ax^2 + bx + c$, where a, b are coefficients and c is a constant. Note: $a \neq 0$

Why can't $a = 0$?

$$y = ax^2 + bx + c$$
$$y = 0(x^2) + bx + c$$
$$y = bx + c$$ ⇦ This is linear

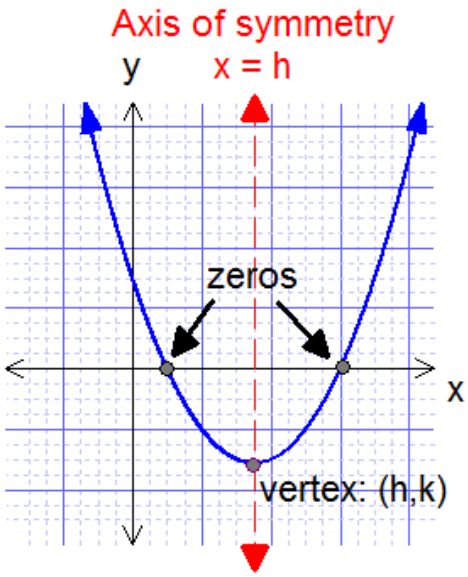


Here are three examples of quadratic relations; state the values of a, b and c.

$y = 2x^2 + 3x + 1$ $y = 5x^2 - 4$ $y = x^2$

Features of Quadratics

- The ***vertex*** of a parabola is either _____ (opens up) or _____ (opens down).
- A _____ which goes through the vertex is called the _____.
- The _____ of a parabola are called its _____ or _____.



Using first and second differences.

- Linear Relation: _____
  (ie. slope) the relation is **linear.**

- Quadratic Relation: _____
  the relation is **quadratic.**

both depend on a constant increment of the independent variable

Ex.3 Calculate the first and second differences to determine whether the relation is linear, quadratic, or neither.

x	y
-1	5
0	7
1	9
2	11
3	13

x	y
-2	3
-1	-3
0	-5
1	-3
2	3

x	y
-3	7
0	4
3	1
6	-2
9	-5

x	y
1	4
2	6
3	12
4	18
5	28

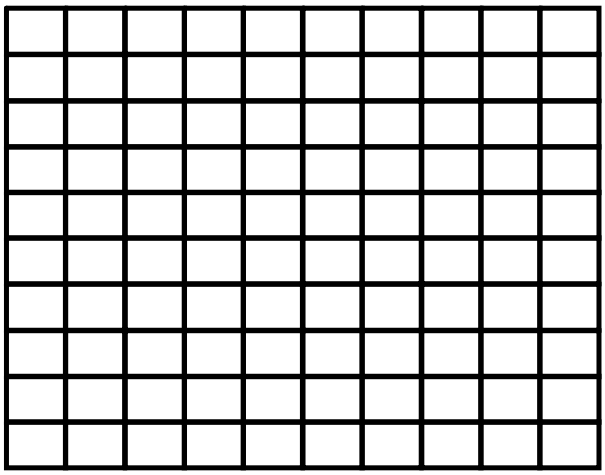
Applications

Ex. 4 The path of a golf ball is modelled by the equation $y = -x^2 + 5x$, where x represents the horizontal distance travelled by the ball in metres and y represents the height of the ball in metres.

a) Complete the table of values and graph the relation.

x	y

$y = -x^2 + 5x$



b) Determine the coordinates of the vertex.

c) What was the maximum height of the ball?

d) How far away does the ball land?

e) What was the height of the ball 4 m away from the golfer?