MCF3M                                                   Unit 1, Lesson 6

# Introduction to Quadratic Functions

We will look at many different types of functions in this course. We will begin with quadratic functions, something you should be familiar with from grade 10.
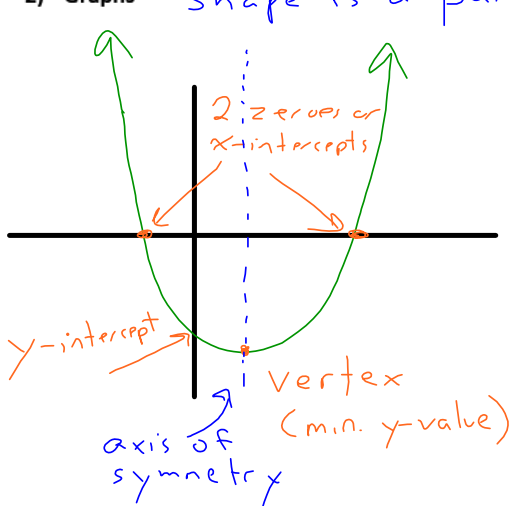
Keeping in mind that functions could be defined, using an equation, graph or table of values, we will now list some characteristics of quadratic functions.
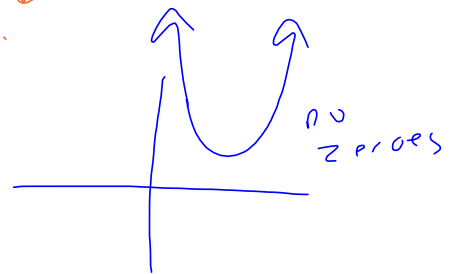
1) **Equations** $\boxed{x^2}$   polynomials of degree 2

$$y = 3x - 1$$
$$y = x^3 + x^2 - 1$$
$$y = \frac{x}{x^2}$$

standard form: $y = 2x^2 + x - 5$
vertex form: $y = 2(x-1)^2 + 4$
factored form: $y = (x-2)(x+5)$

2) **Graphs**   shape is a parabola.

opens up
opens down

2 zeroes or
x-intercepts

y-intercept

vertex
(min. y-value)

axis of
symmetry

no zeroes

3) **Table of Values**

2nd differences
are all equal.

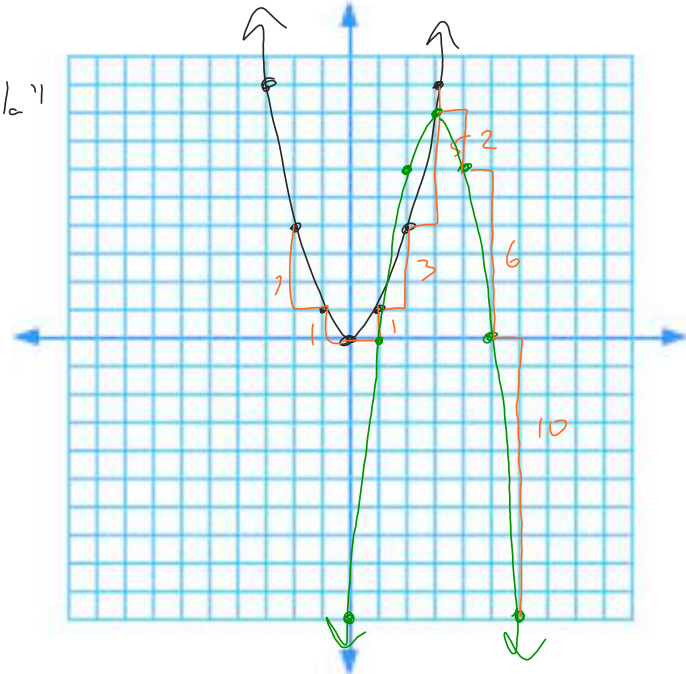| x | y | 1st differences | 2nd differences |
|---|---|---|---|
| 0 | -1 | 1 | 2 |
| 1 | 0 | 3 | 2 |
| 2 | 3 | 5 | 2 |
| 3 | 8 | 7 | 2 |
| 4 | 15 | 9 | 2 |
| 5 | 24 | 11 | 2 |
| 6 | 35 | | |

1. Graph each of the following by completing a table of values. Identify the vertex, zeroes, y-intercept, equation of axis and step pattern for each.

a) $f(x) = x^2$   "base parobola"

| x | f(x) |
|---|------|
| -3 | 9 |
| -2 | 4 |
| -1 | 1 |
| 0 | 0 |
| 1 | 1 |
| 2 | 4 |
| 3 | 9 |

b) $g(x) = -2x^2 + 12x - 10$

| x | f(x) |
|---|------|
| 0 | -10 |
| 1 | 0 |
| 2 | 6 |
| 3 | 8 |
| 4 | 6 |
| 5 | 0 |
| 6 | -10 |



|  | vertex | y-intercept | Zeroes | Equation of axis | "Step Pattern" |
|---|--------|-------------|--------|------------------|----------------|
| $f(x) = x^2$ | (0,0) | (0,0) | (0,0) or just 0 | $x=0$ | 1,3,5,7... |
| $g(x) = -2x^2 + 12x -10$ | (3,8) | -10 or (0,-10) | 1 and 5 | $x=3$ | 2,6,10,14... |

2. Examine each table of values. Does the table represent a quadratic function?

| x | f(x) |
|---|------|
| -3 | -8 |
| -2 | -5 |
| -1 | -2 |
| 0 | 1 |
| 1 | 4 |
| 2 | 7 |
| 3 | 10 |

linear

| x | f(x) |
|---|------|
| -3 | 17 |
| -2 | 7 |
| -1 | 1 |
| 0 | -1 |
| 1 | 1 |
| 2 | 7 |
| 3 | 17 |

quadratic

| x | f(x) |
|---|------|
| -3 | 1 |
| -2 | -3 |
| -1 | 1 |
| 0 | 0 |
| 1 | 5 |
| 2 | 6 |
| 3 | 11 |

neither