L1 – Intro to Quadratics Unit 4

MPM2D

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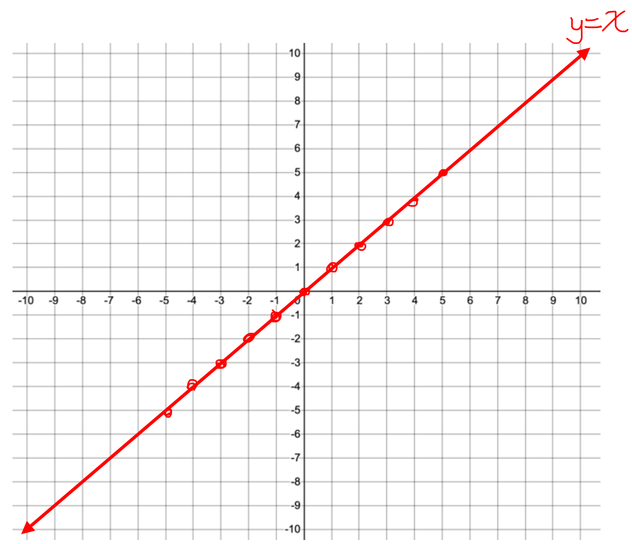
Section 1: Properties of Quadratics

The simplest form a **LINEAR** relationship is $y = x$

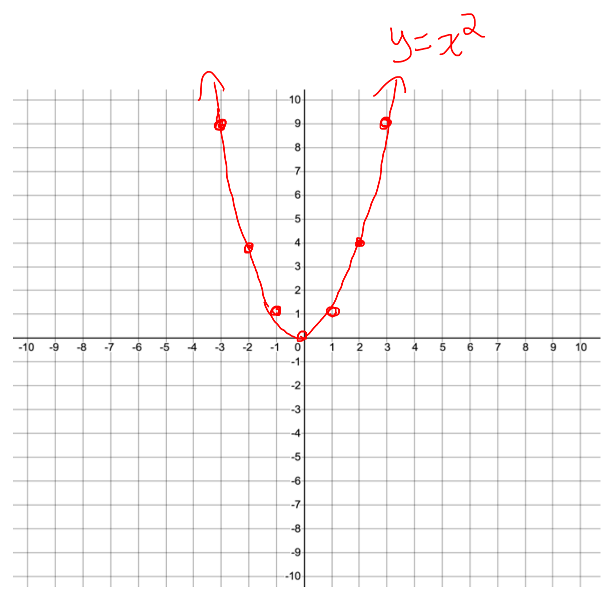
x	y	1st Differences
-3	-3	
-2	-2	$-2-(-3)=1$
-1	-1	$-1-(-2)=1$
0	0	$0-(-1)=1$
1	1	$1-0=1$
2	2	$2-1=1$
3	3	$3-2=1$



Notice that the column of 1st finite differences is ***constant*** *for linear relationships.*

The simplest form a **QUADRATIC** relationship is $y = x^2$

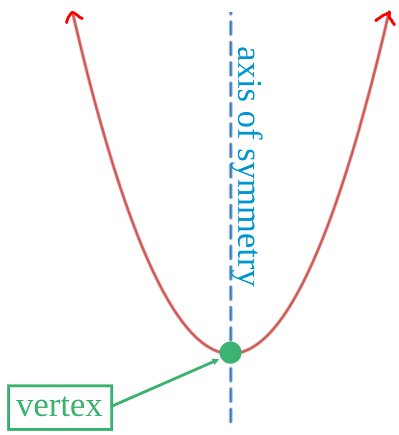
x	y	1st Differences	2nd Differences
-3	9		
-2	4	$4-9=-5$	
-1	1	$1-4=-3$	$-3-(-5)=2$
0	0	$0-1=-1$	$-1-(-3)=2$
1	1	$1-0=1$	$1-(-1)=2$
2	4	$4-1=3$	$3-1=2$
3	9	$9-4=5$	$5-3=2$

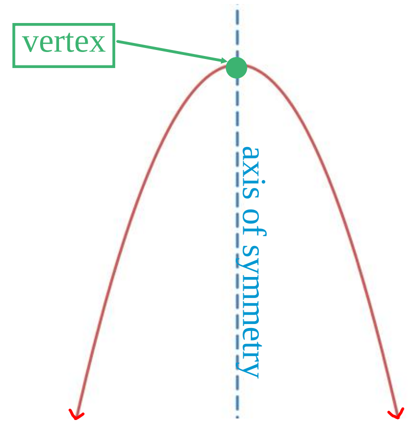


Notice that the column of 2nd column of finite differences is ***constant*** *for quadratic relationships.*

Properties of Quadratics

- The shape of the graph of a quadratic relation is called a **PARABOLA**
- A parabola has a maximum or minimum point called a **VERTEX**
- If the parabola opens up, the vertex is a **MINIMUM** point
- If the parabola opens down, the vertex is a **MAXIMUM** point
- Parabolas are symmetrical
- The vertical line that passes through the vertex is the **AXIS OF SYMMETRY**





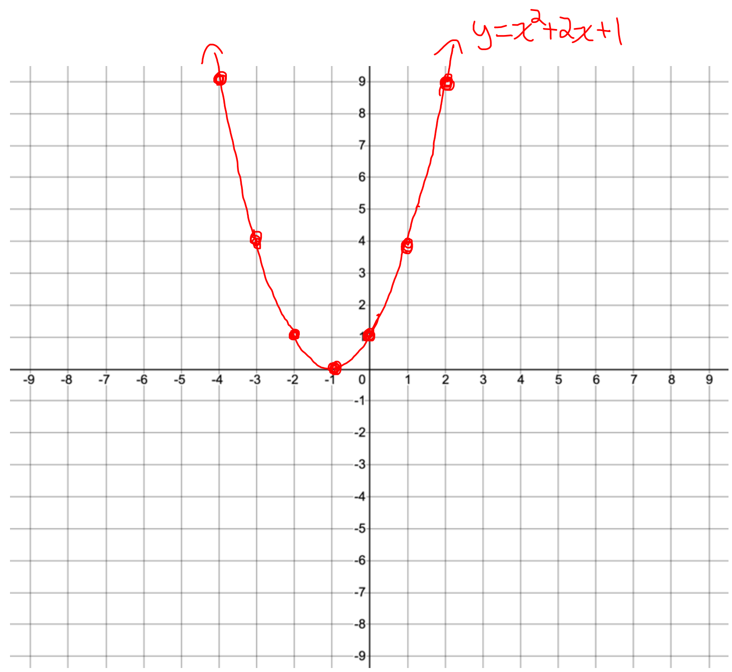
Section 2: Quadratics in Standard Form

The standard form of a quadratic equation is

$$y = ax^2 + bx + c$$

Example 1: For the function $y = x^2 + 2x + 1$, sketch a graph by completing the given table of values, then state the vertex and axis of symmetry.

x	y
-4	9
-3	4
-2	1
-1	0
0	1
1	4
2	9



vertex: $(-1, 0)$

axis of symmetry: $x = -1$

Properties of Quadratics from the Standard Form Equation → $y = ax^2 + bx + c$

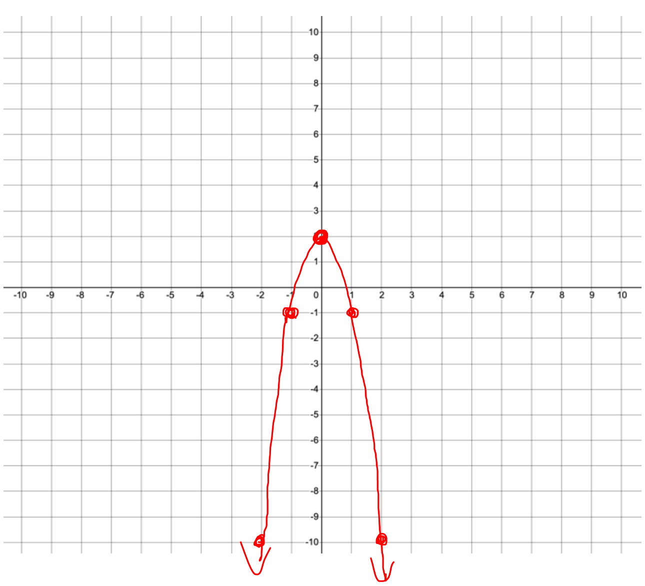
- If $a > 0$, the parabola opens **UP**
- If $a < 0$, the parabola opens **DOWN**
- The ***y*-intercept** is at $(0, c)$

Example 2: State the direction of opening and y-intercept of the given quadratic, then make a table of values and sketch the graph to verify.

a) $y = -3x^2 + 2$

- opens Down
- y-int: (0,2)

x	y
-3	-25
-2	-10
-1	-1
0	2
1	-1
2	-10
3	-25



b) $y = 2x^2 - 8x + 3$

- opens up
- y-int: (0,-3)

x	y
-1	13
0	3
1	-3
2	-5
3	-3
4	3
5	13