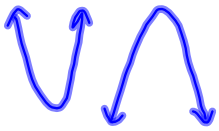
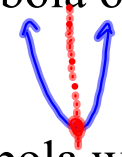
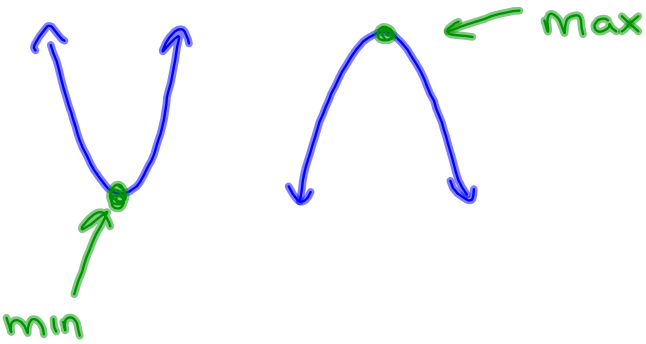
Non- Linear Relationships and Functions

Quadratic Functions and Their Graphs

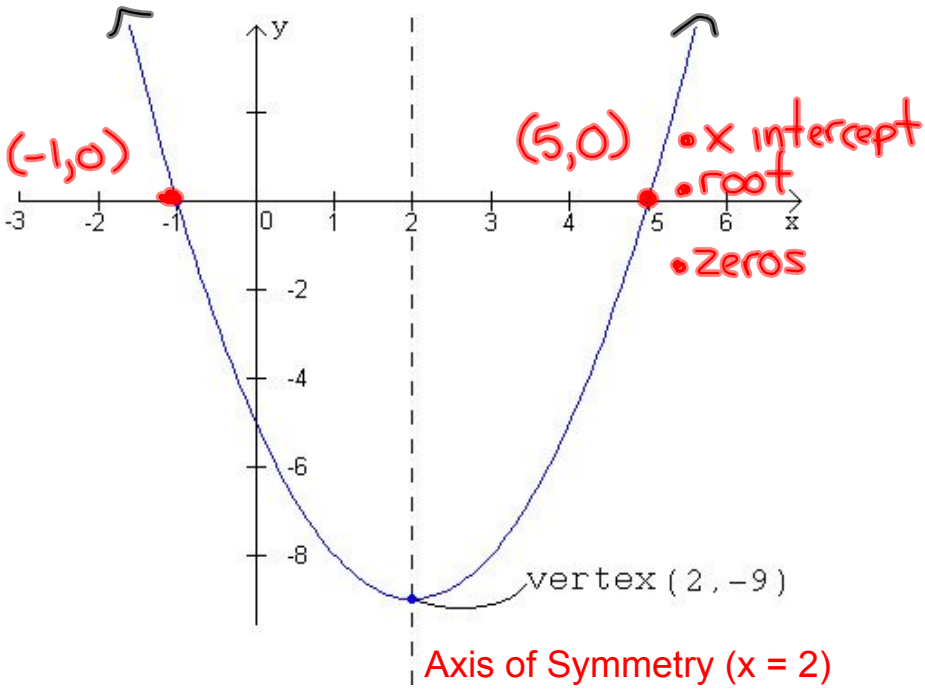
Parabola = the curved graph of a quadratic equation 

Axis of Symmetry = a line in which a parabola or other graph is reflected onto itself. 

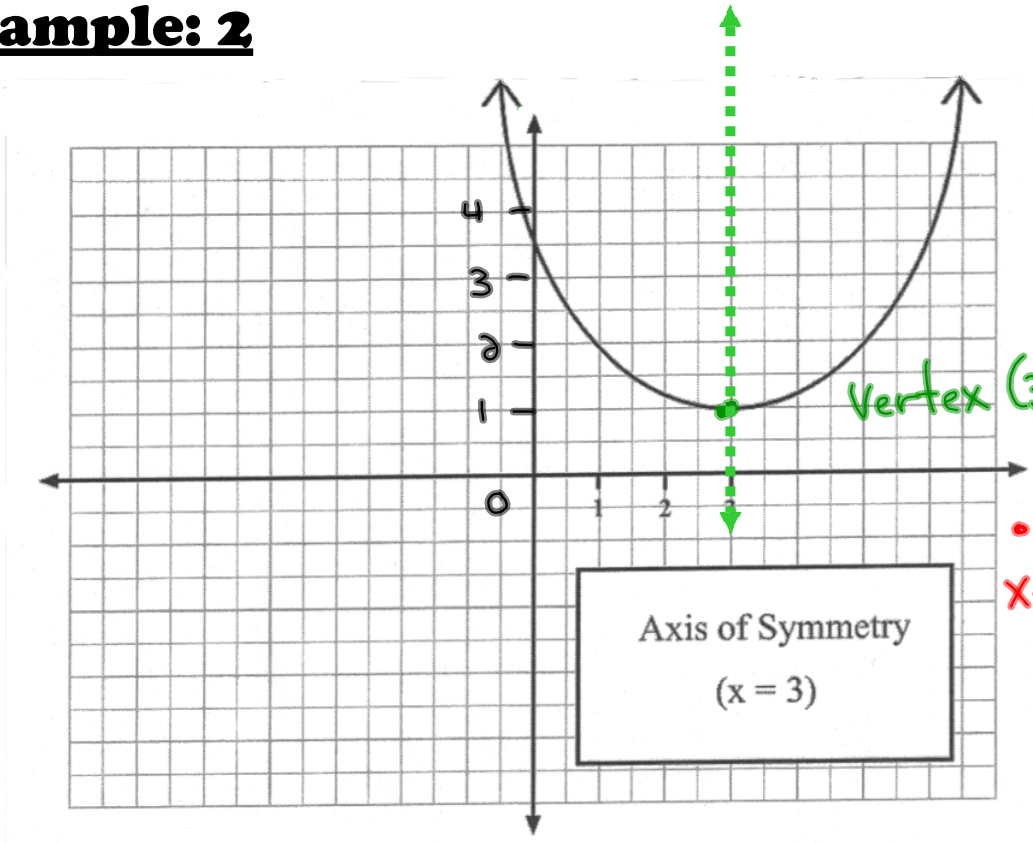
Vertex of a Parabola = the point on a parabola where a minimum or maximum y-value occurs.



Example: 1

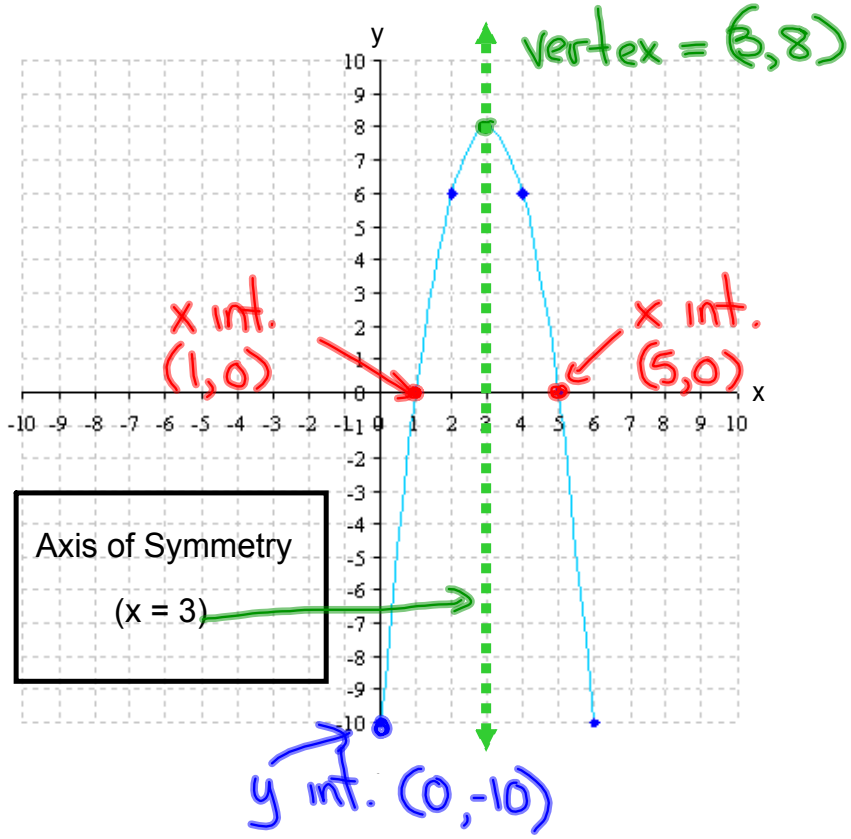

y
x
(-1,0)
(5,0)
• x intercept
• root
• zeros
-3
-2
-1
0
1
2
3
4
5
6
-2
-4
-6
-8
vertex (2, -9)
Axis of Symmetry (x = 2)

Example: 2



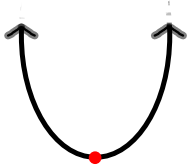
• has no x-intercepts

Example: 3



Minimum and Maximum Values

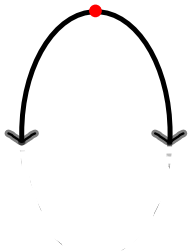
Minimum Value - The co-ordinate of the vertex when a parabola opens upward.



(positive stretch factor)

$y = (x-4)(x-3)$

Maximum Value - The co-ordinate of the vertex when a parabola opens downward.



(negative stretch factor)

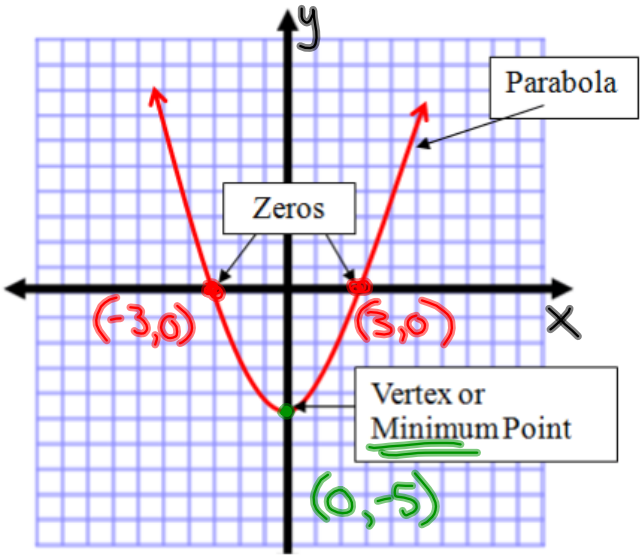
$y = -(x-4)(x-3)$

Zeros of a Function(when y=0)

Roots or x intercepts.

The values of x which make the quadratic function equal to zero (y = 0)

To find the zeros of a function, look for the x-intercepts .
For Example:



Example:

Graph the following function:

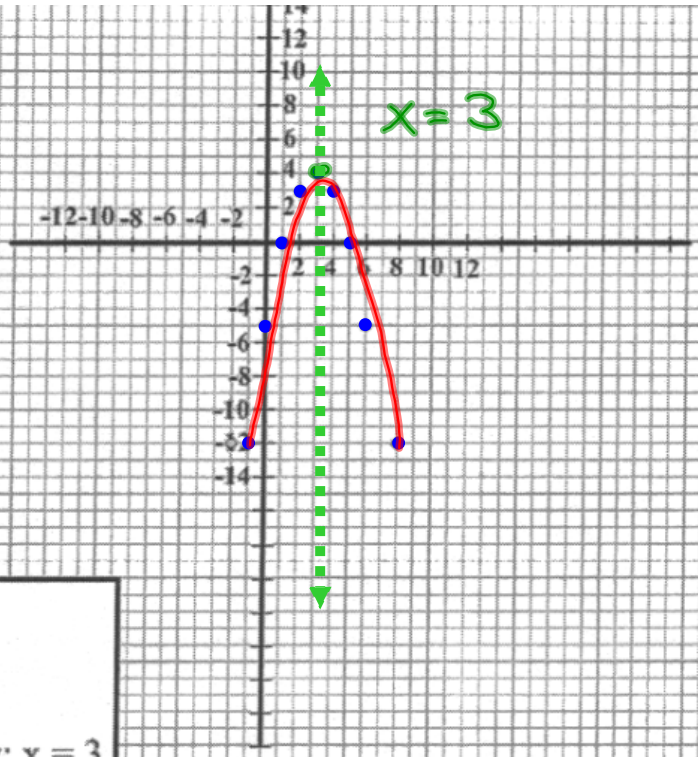
equation

$y = -x^2 + 6x - 5$, $-1 \leq x \leq 7$

Determine the following:

- Domain (the set of x values)
- Range (the set of y values)
- Coordinates of Vertex
- Equation of the Axis of Symmetry
- The Zeros of the function
- Maximum or Minimum Value

x	y
-1	-12
0	-5
1	0
2	3
3	4
4	3
5	0
6	-5
7	-12



Domain: $\{-1 \leq x \leq 7,\ x \in R\}$
Range: $\{-12 \leq y \leq 4,\ y \in R\}$
Coordinate of Vertex: (3, 4)
Equation of Axis of Symmetry: $x = 3$
Zeros of the Function: $x = 1, x = 5$
Maximum Value: (3, 4)

Example 2:

Graph the following function:

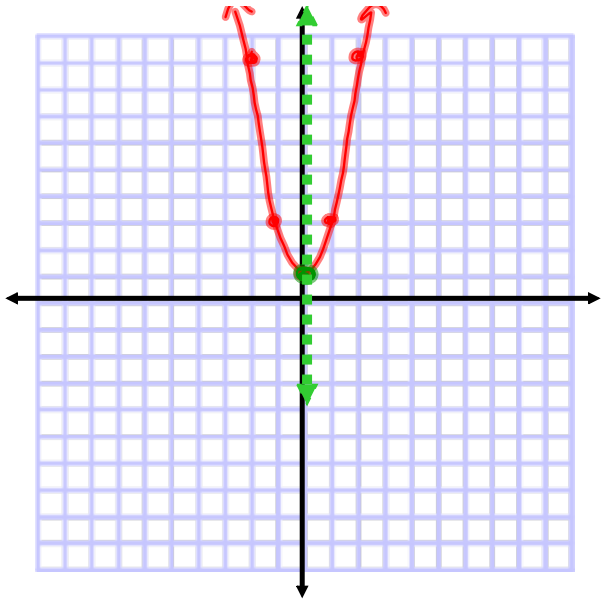
$y = 2x^2 + 1$

Determine the following:

- Domain
- Range
- Coordinates of Vertex
- Equation of the Axis of Symmetry
- Maximum or Minimum Value

$y = 2x^2 + 1$

x	y
−3	19
−2	9
−1	3
0	1
1	3
2	9
3	19



- Domain $\{x \in R\}$
- Range $\{y > 1, y \in R\}$
- Coordinates of Vertex $(0,1)$
- Equation of the Axis of Symmetry $x = 0$
- Maximum or Minimum Value min $(0,1)$

① a) $y = -x^2 + 4x + 1$

$A(\overset{x}{0}, \overset{y}{1})$

$1 = -(0)^2 + 4(0) + 1$

$1 = 0 + 0 + 1$

$1 = 1$

$B(\overset{x}{3}, \overset{y}{-4})$

$-4 = -(3)^2 + 4(3) + 1$

$-4 = -9 + 12 + 1$

$-4 = 4$

B is not on the curve