

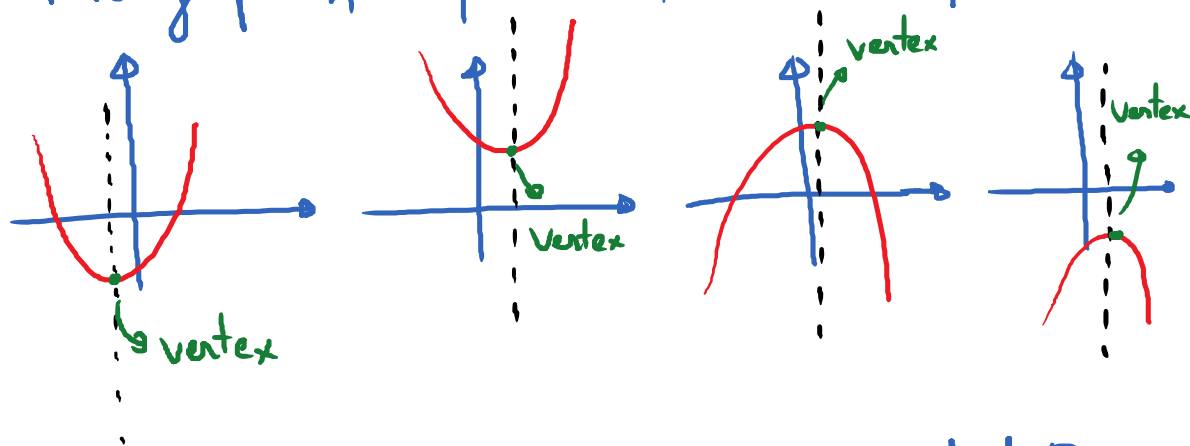
### 3.1 Quadratic Functions

Thursday, October 26, 2017 9:56 AM

#### Obj 1: Graph Quadratic Function in Standard Forms

A quadratic function is a function whose formula looks like  $f(x) = ax^2 + bx + c$ ;  $a \neq 0$ .  
(general form).

The graph of a quadratic function is a parabola

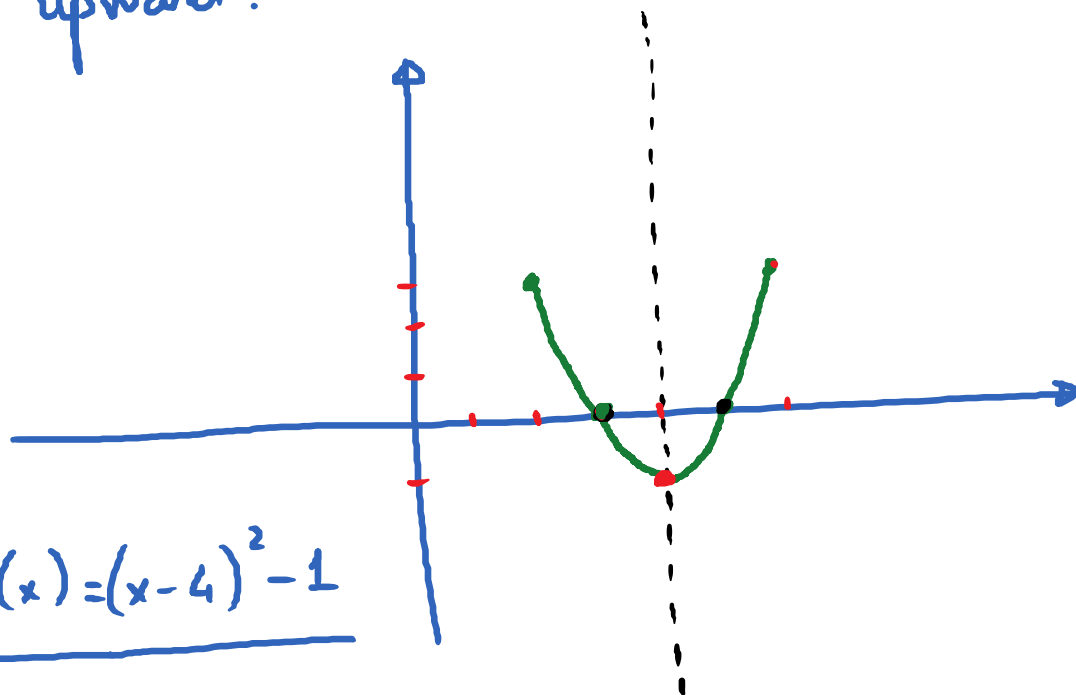


E.g. A quadratic function given in Standard Form

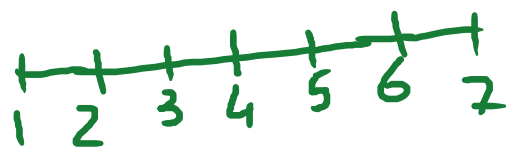
$$f(x) = (x - 4)^2 - 1.$$

Compare this function with the basic function  $y = x^2$   
whose vertex is  $(0, 0)$

and points upward. We see that the vertex of  $f(x) = (x-4)^2 - 1$  is  $(4, -1)$  and it points upward.

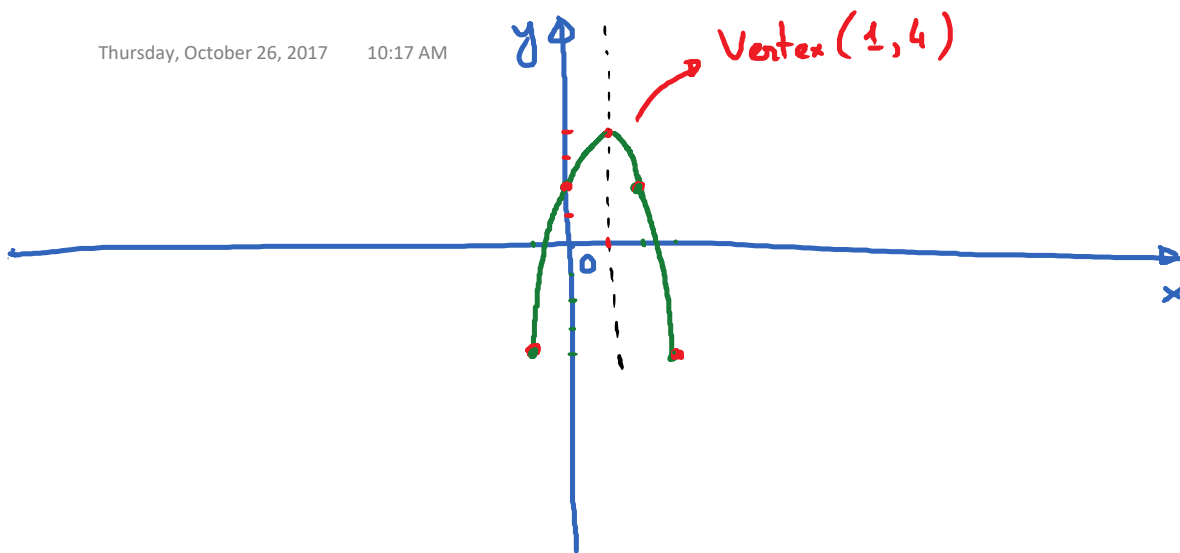


$x$	$f(x) = (x-4)^2 - 1$
4	-1
3	0
5	0
2	3
6	3

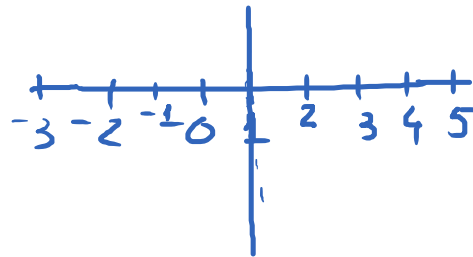


E.g. Graph  $f(x) = -2(x-1)^2 + 4$

Vertex:  $(1, 4)$ . Points downward.



x	$f(x) = -2(x - 1)^2 + 4$
1	4
0	2
2	2
-1	-4
3	-4



The standard form of a quadratic function is:

$$f(x) = a(x - h)^2 + k, \quad a \neq 0.$$

- ① If  $a > 0$ , the parabola points upward  
 If  $a < 0$ , the parabola points downward.

② Vertex is the point  $(h, k)$

③ The parabola is symmetric with respect to the vertical line  $x = h$ . We just need to choose  $x$ -values on both sides of  $x = h$  and plug them into the formula to determine points on the parabola.

Obj 2: Transform the general form into the standard form for quadratic functions.

Given  $f(x) = ax^2 + bx + c$ ,  $a \neq 0$ , to turn this into standard form:

$$h = -\frac{b}{2a} ; k = f\left(-\frac{b}{2a}\right)$$

→ Standard form:  $f(x) = a(x - h)^2 + k$ .

E.g.  $f(x) = x^2 + 3x - 10$  ;  $a = 1$  ;  $b = 3$

→ turn this into standard form: