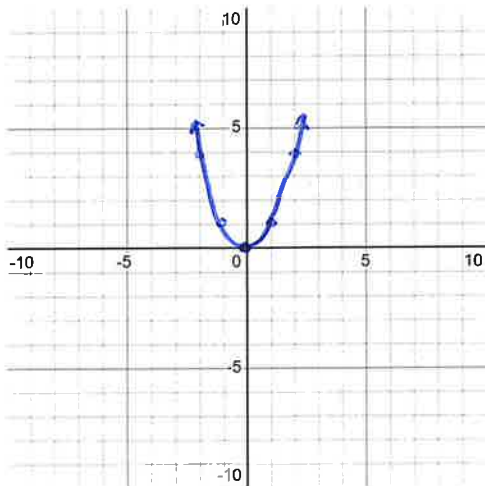


Include: Axis of Symmetry  
Vertex  
Domain  
Range

Graphing Parabolas

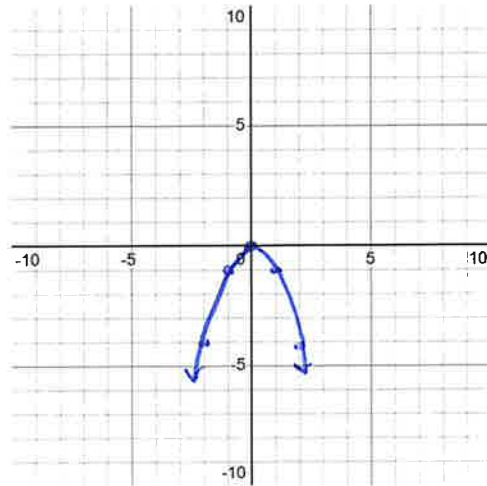
No Shift – Find your Axis of Symmetry

$$y = x^2$$



no shift  
vertex: (0,0)  
A of S:  $x = 0$   
D:  $\{x \mid x \in \mathbb{R}\}$   
R:  $\{y \mid y \geq 0; y \in \mathbb{R}\}$

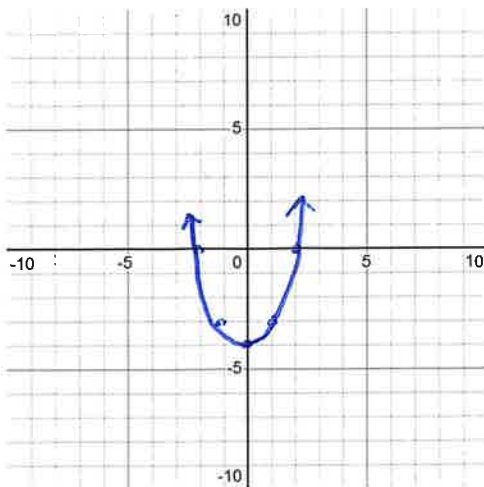
$$y = -x^2$$



no shift but -1 a-term  
so down behaviour  
vertex: (0,0)  
A of S:  $x = 0$   
D:  $\{x \mid x \in \mathbb{R}\}$   
R:  $\{y \mid y \leq 0; y \in \mathbb{R}\}$

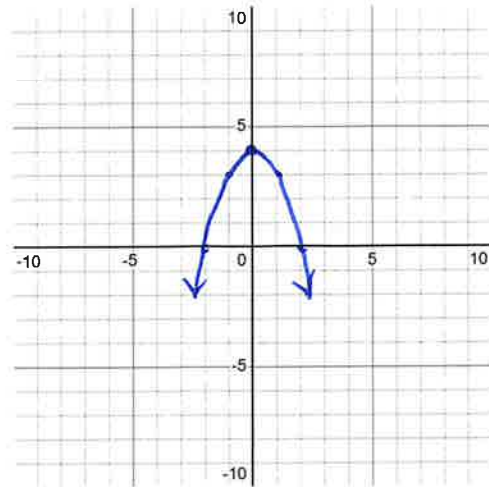
Vertical Shift – Find your Axis of Symmetry

$$y = x^2 - 4 \leftarrow \text{shift down 4}$$



vertex: (0, -4)  
A of S:  $x = 0$   
D:  $\{x \mid x \in \mathbb{R}\}$   
R:  $\{y \mid y \geq -4; y \in \mathbb{R}\}$

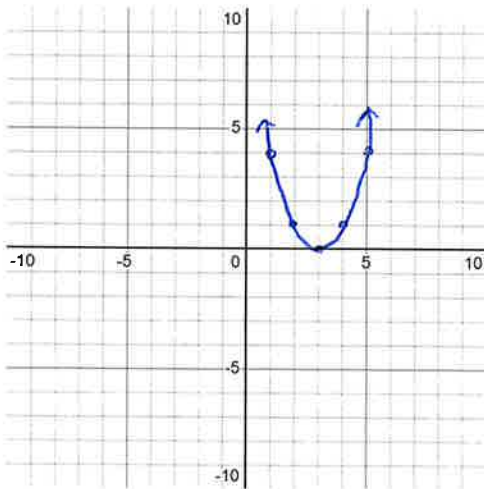
$$y = -x^2 + 4$$



shift up: 4  
vertex: (0, 4) A of S:  $x = 0$   
D:  $\{x \mid x \in \mathbb{R}\}$   
R:  $\{y \mid y \leq 4; y \in \mathbb{R}\}$

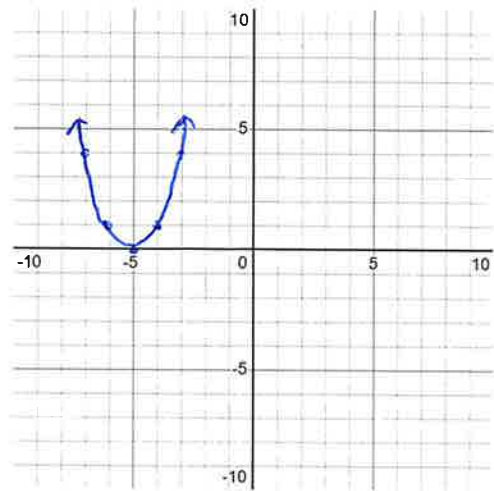
**Horizontal Shift** – What makes the inner portion 0? That is your Axis of Symmetry

$$y = (x - 3)^2$$



Vertex:  $(3, 0)$   
 Axis of Symmetry:  $x = 3$   
 Domain:  $\{x \mid x \in \mathbb{R}\}$   
 Range:  $\{y \mid y \geq 0; y \in \mathbb{R}\}$

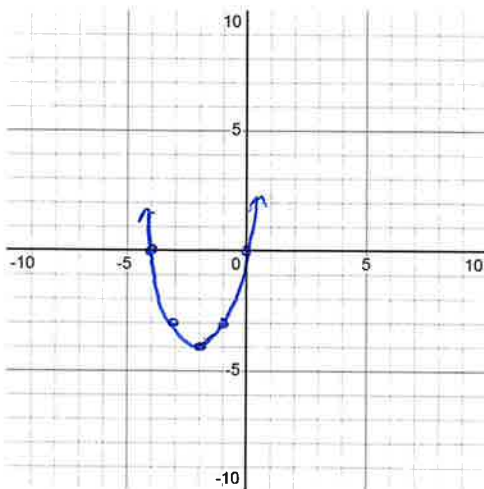
$$y = (x + 5)^2$$



Vertex:  $(-5, 0)$   
 Axis of Symmetry:  $x = -5$   
 Domain:  $\{x \mid x \in \mathbb{R}\}$   
 Range:  $\{y \mid y \geq 0; y \in \mathbb{R}\}$

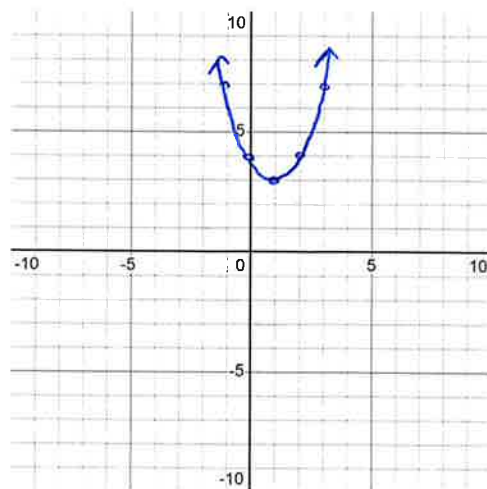
**Both Shift** – What makes the inner portion 0? That is your Axis of Symmetry

$$y = (x + 2)^2 - 4$$



Vertex:  $(-2, -4)$   
 Axis of Symmetry:  $x = -2$   
 Domain:  $\{x \mid x \in \mathbb{R}\}$   
 Range:  $\{y \mid y \geq -4; y \in \mathbb{R}\}$

$$y = (x - 1)^2 + 3$$



Vertex:  $(1, 3)$   
 Axis of Symmetry:  $x = 1$   
 Domain:  $\{x \mid x \in \mathbb{R}\}$   
 Range:  $\{y \mid y \geq 3; y \in \mathbb{R}\}$