

**PART A - Graphing Parabolas of the Form  $y = x^2 + k$**

Complete each table of values below and graph the quadratic relationship to the right. Complete the blanks below each graph as well. Add the graph of  $y=x^2$  to each graph as well.

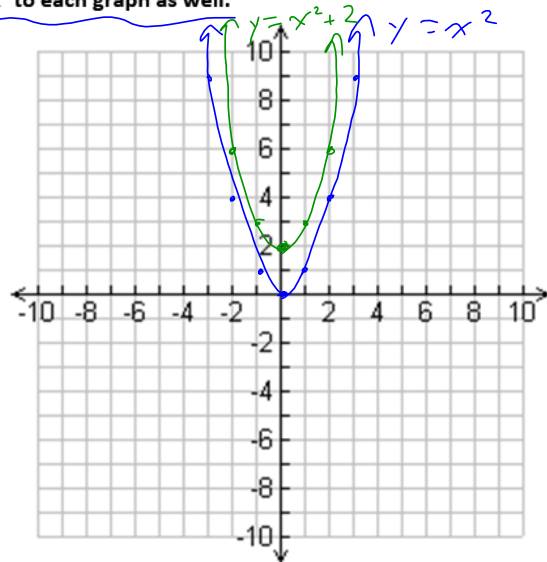
Equation:  $y = x^2 + 2$

| x  | y  |
|----|----|
| -3 | 11 |
| -2 | 6  |
| -1 | 3  |
| 0  | 2  |
| 1  | 3  |
| 2  | 6  |
| 3  | 11 |

Vertex:  $(0, 2)$       Zeroes: none

Step Pattern: 1, 3, 5, 7, ...

Direction of Opening: up



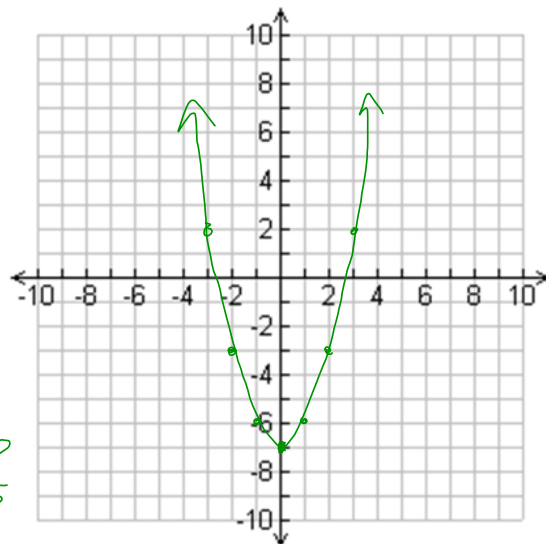
Equation:  $y = x^2 - 7$

| x  | y  |
|----|----|
| -3 | 2  |
| -2 | -3 |
| -1 | -6 |
| 0  | -7 |
| 1  | -6 |
| 2  | -3 |
| 3  | 2  |

Vertex:  $(0, -7)$       Zeroes: 2.5, -2.5

Step Pattern: 1, 3, 5, 7, ...

Direction of Opening: up

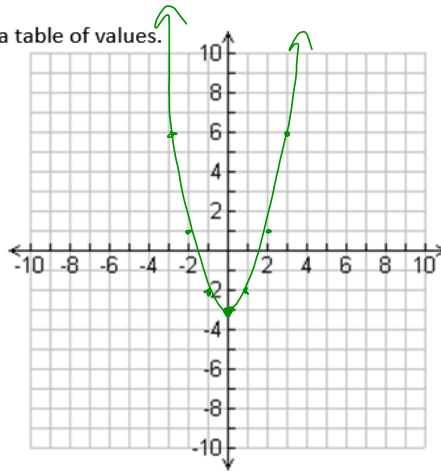


**Summary**

The graph of  $y = x^2 + k$  is the graph of  $y = x^2$  shifted up/down  $k$  units

The step pattern will be 1, 3, 5, 7, .... The vertex will be at  $(0, k)$ .

Sketch the graph of  $y = x^2 - 3$  below without making a table of values.

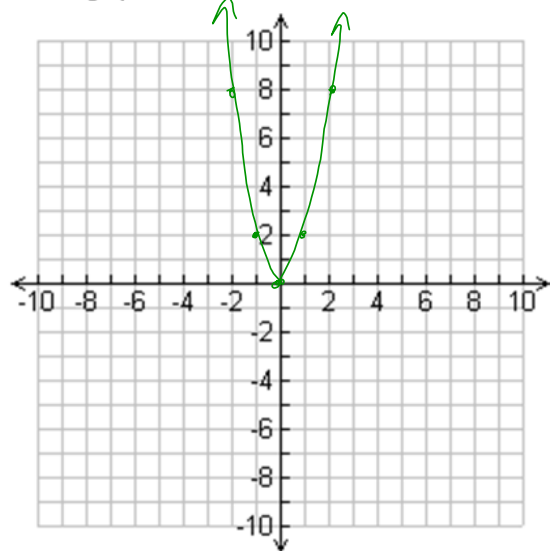


**PART B - Graphing Parabolas of the Form  $y = ax^2$**

Complete each table of values below and graph the quadratic relationship to the right. Complete the blanks below each graph as well. **Add the graph of  $y=x^2$  to each graph as well.**

**Equation:**  $y = 2x^2$

| x  | y  |
|----|----|
| -3 | 18 |
| -2 | 8  |
| -1 | 2  |
| 0  | 0  |
| 1  | 2  |
| 2  | 8  |
| 3  | 18 |



**Vertex:**  $(0, 0)$       **Zeros:**  $(0, 0)$

**Step Pattern:** 2, 6, 10, 14, ...

**Direction of Opening:** up

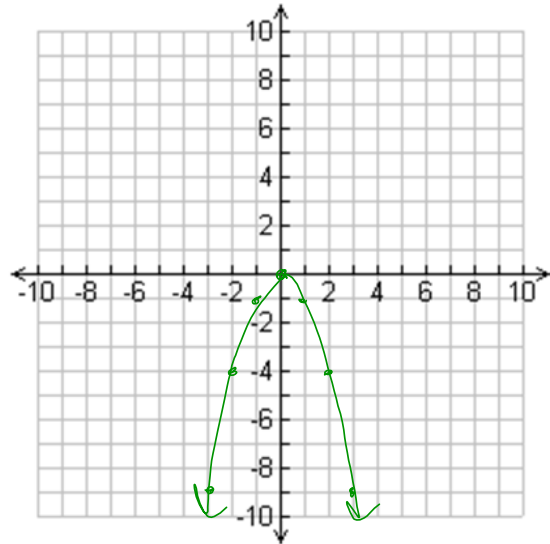
Equation:  $y = -x^2$

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

Vertex:  $(0, 0)$       Zeroes: 0

Step Pattern: -1, -3, -5, -7...

Direction of Opening: down



Equation:  $y = 0.5x^2$

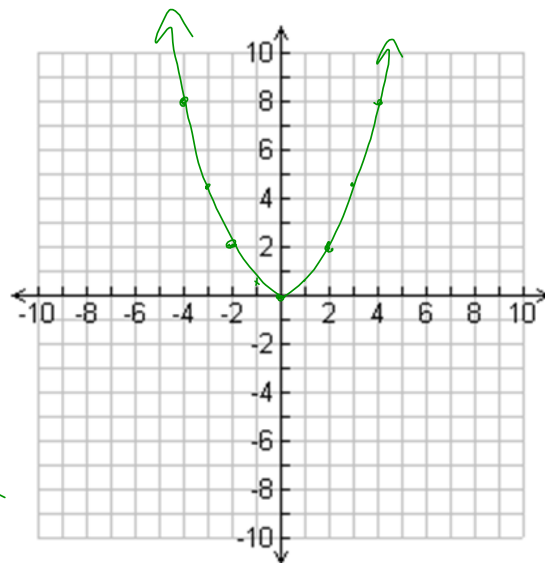
| x  | y   |
|----|-----|
| -3 | 4.5 |
| -2 | 2   |
| -1 | 0.5 |
| 0  | 0   |
| 1  | 0.5 |
| 2  | 2   |
| 3  | 4.5 |

4      8

Vertex:  $(0, 0)$       Zeroes: 0

Step Pattern: 0.5, 1.5, 2.5, 3.5...

Direction of Opening: up



**Summary**

↻ The graph of  $y = ax^2$  is the graph of  $y = x^2$  vertically stretched or compressed. If  $a > 1$  or  $a < -1$  the graph is stretched. If  $-1 < a < 1$  the graph is compressed.

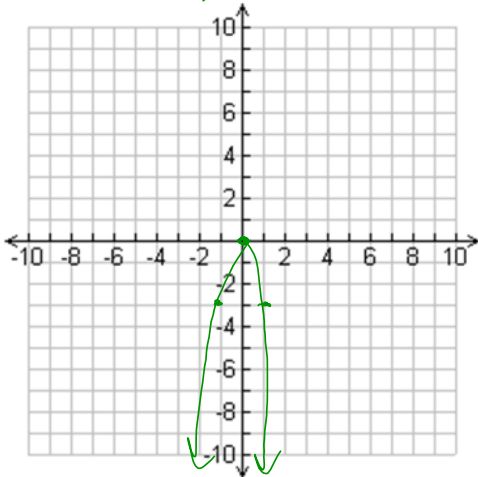
If  $a > 0$  the parabola opens up.

If  $a < 0$  the graph is reflected in x-axis and the parabola opens down.

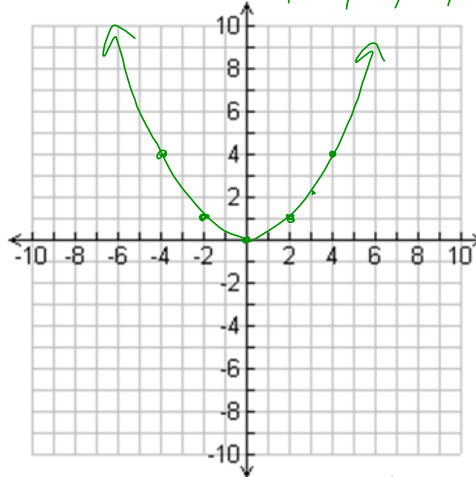
The "step pattern" of the parabola will be:  $1, 3, 5, 7 \rightarrow |a|, 3a, 5a, 7a, \dots$

See if you can graph the following without making a table of values.

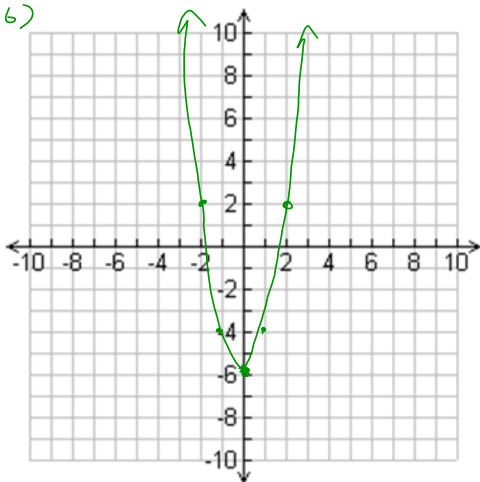
$y = -3x^2$       $1, 3, 5, 7, \dots$   
 $3, 9, 15, 21, \dots$



$y = 0.25x^2$       $1, 3, 5, 7, 9, 11$   
 $\frac{1}{4}, \frac{3}{4}, \frac{5}{4}, \frac{7}{4}, \frac{9}{4}, \dots$



up  
 $(0, -6)$      step 2, 6, 10, ...



$y = -x^2 + 8$      down  
vertex (0, 8)      $1, 3, 5, 7, \dots$

