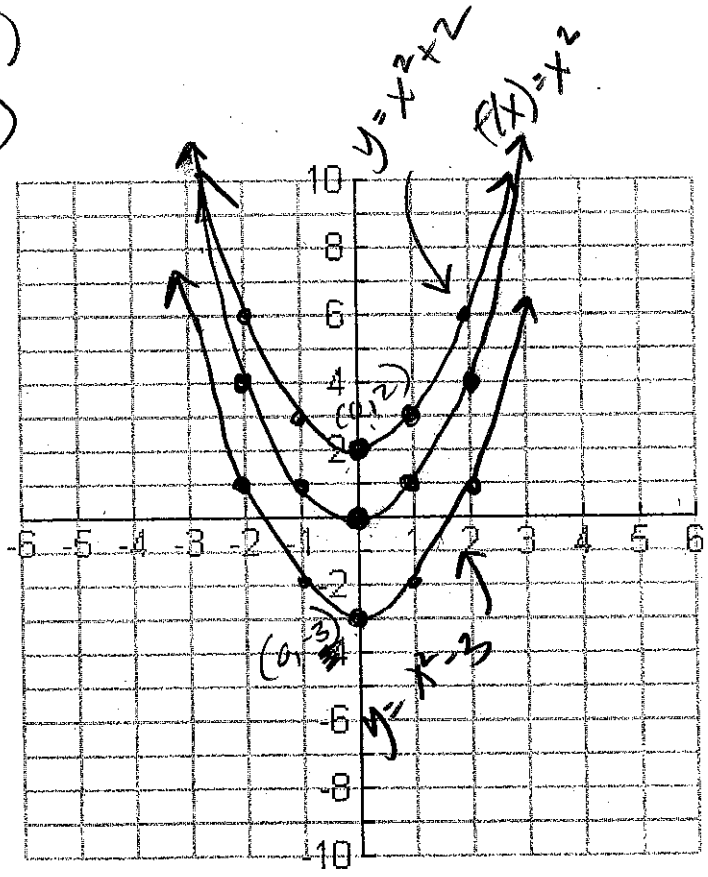
Answer Key

Graphing Quadratic Functions Exploration

1. Using a graphing calculator, graph the function $f(x)=x^2$; sketch the graph on the grid using 5 exact points.
   - *a. What is the domain? $(-\infty,\infty)$ ℝ
   - b. What is the range? $[0,\infty)$
2. Graph (in a different color) $f(x)=x^2+2$ on the same graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.
   - a. What is the domain? $(-\infty,\infty)$
   - b. What is the range? $[2,\infty)$
3. Graph (in a different color) $f(x)=x^2-3$ on the same graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.
   - a. What is the domain? $(-\infty,\infty)$
   - b. What is the range? $[-3,\infty)$



$y=a(x-h)^2+k$

4. Describe the effect of k on the equation $f(x)=x^2+k$

vertical shift
* $k>0$ shift up x^2+2
* $k<0$ shift down x^2-3

5. Create and graph your own function and determine if your hypothesis (answer from #4) is correct.

$y=x^2+b$

$y=x^2-5$

$y = a(x-h)^2 + k$ (h, k)

6. Graph (in a different color) $f(x)=(x+2)^2$ on the provided graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.

   a. What is the domain? $(-\infty, \infty)$

   b. What is the range? $[0, \infty)$

   * shifted 2 left

7. Graph (in a different color) $f(x)=(x-3)^2$ on the same graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.

   a. What is the domain? $(-\infty, \infty)$

   b. What is the range? $[0, \infty)$

   * shifted 3 Right

8. Describe the effect of *h* on the equation $f(x)=(x-h)^2$

   Horizontal shift (Left or Right) $h=3$

   $h>0$ Right $(x-3)^2$

   $h<0$ Left $(x+2)^2$ $h=-2$

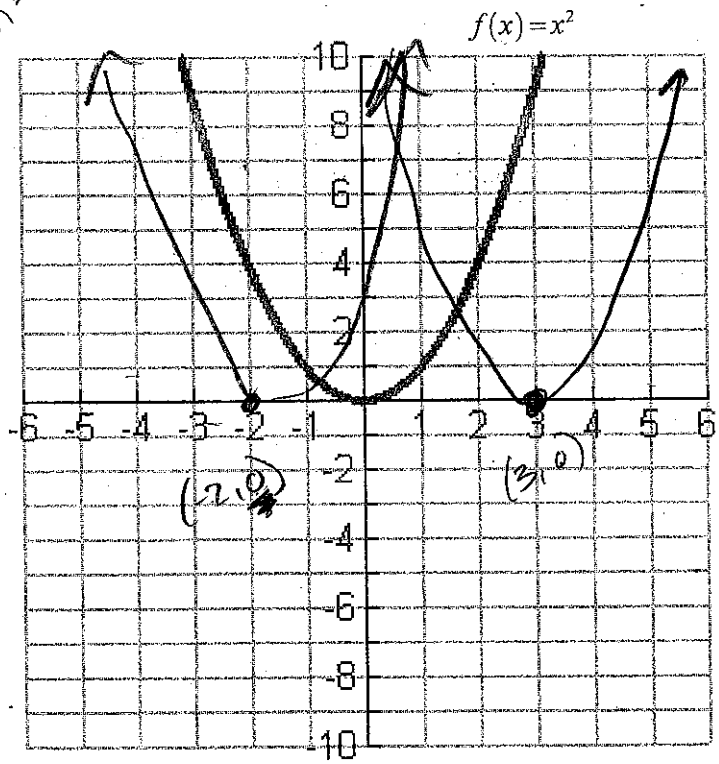
9. Create and graph your own function and determine if your hypothesis (answer from #8) is correct.

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

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

   Left 4

   down 2



$y = a(x-h)^2 + k$

10. Graph (in a different color) $f(x)=2x^2$ on the provided graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.

    a. What is the domain? $(-\infty, \infty)$
    b. What is the range? $[0, \infty)$

    skinnier (stretch)

11. Graph (in a different color) $f(x)=\frac{1}{2}x^2$ on the same graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.

    a. What is the domain? $(-\infty, \infty)$
    b. What is the range? $[0, \infty)$

    wider (shrink)

12. Graph (in a different color) $f(x)=-x^2$ on the provided graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.

    a. What is the domain? $(-\infty, \infty)$
    b. What is the range? $(-\infty, 0]$

13. Graph (in a different color) $f(x)=-3x^2$ on the same graph using 5 exact points. Describe the difference between this graph and the graph of $f(x)=x^2$.

    a. What is the domain? $(-\infty, \infty)$
    b. What is the range? $(-\infty, 0]$

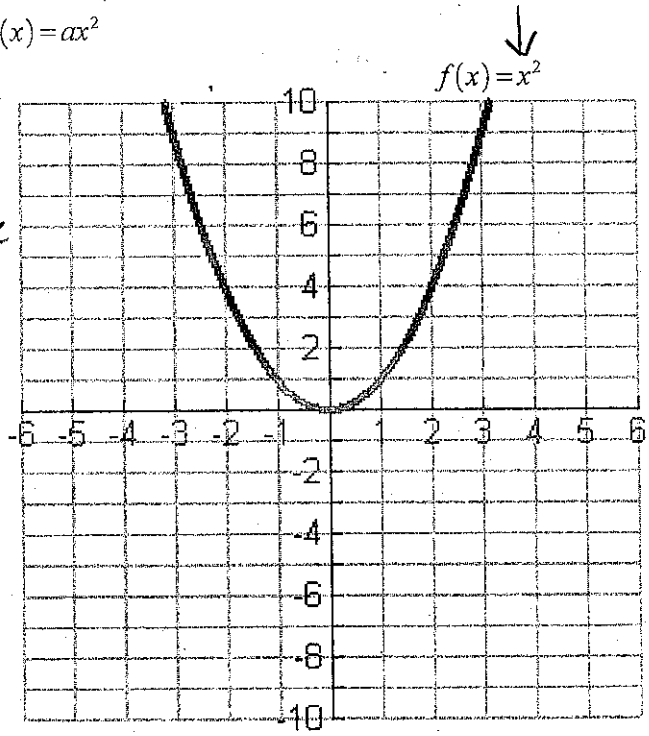
$y = a(x-h)^2 + k$

14. Describe the effect of a on the equation $f(x)=ax^2$

* Reflection $a>0$ ↑ $a<0$ ↓

$a>1$ stretch $a<1$ shrink

15. Create and graph your own function and determine if your hypothesis (answer from #14) is correct..



Transformation Practice:

In the following functions, the transformations have been combined on the quadratic function that you just discovered. Using the parent graph **y = x²** list each transformation that has occurred.

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

Stretch, Shrink, or neither

Horizontal shift: left 2

Vertical Shift: down 3

Opens: up

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

Stretch, Shrink, or neither

Horizontal Shift: Right 1

Vertical Shift: up 4

Opens: down

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

Stretch, Shrink, or neither

Horizontal Shift: Right 2

Vertical Shift: down 1

Opens: up

4. $f(x)=-\frac{1}{2}(x+2)^2$

Stretch, Shrink, or neither

Horizontal shift: Left 2

Vertical Shift: None

Opens: done

5. $f(x)=3x^2-5$

Stretch, Shrink, or neither

Horizontal Shift: none.

Vertical Shift: down 5

Opens: up

6. $f(x)=-(x+3)^2+4$

Stretch, Shrink, or neither

Horizontal Shift: Left 3

Vertical Shift: up 4

Opens: down