CCSS Advanced Algebra 3 Match My Parabola Reflection

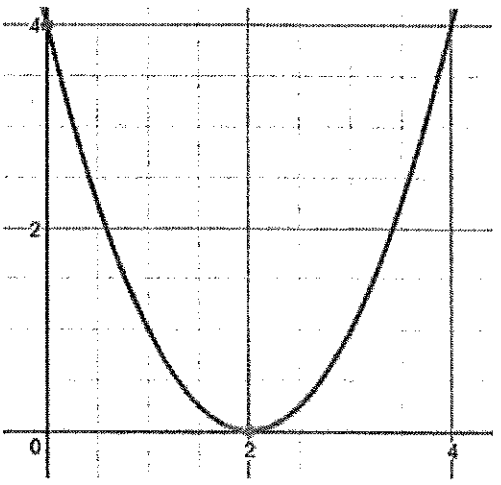
1. What is the difference between the graphs of $f(x) = x^2 + 1$ and $g(x) = x^2 - 1$?

f(x) is shifted up 1 from the origin.
g(x) is shifted down 1.

2. What is the difference between the graphs of $f(x) = x^2 + 1$ and $h(x) = -x^2 + 1$?

f(x) opens up → ∪
h(x) opens down → ∩

3. Linsey wants to create a design on desmos and started with the parabola shown. What equation did she use to create this parabola?



$y = (x-2)^2$

Parentheses move things horizontally.

4. Without graphing, describe the differences in the parabolas that represent the function $p(x) = 4x^2$ and $q(x) = 0.25x^2$.

p(x) is stretched vertically by 4.
q(x) is compressed vertically by 0.25

Vocabulary:

Parent Graph: the graphical representation of the most basic form of function family. The parent graph for Quadratic Functions is the graph of $y = x^2$.

Transformation: changes to the shape, orientation or location of the parent graph. There are three main types of transformations that we will study -- *Translation, Dilation and Reflection* (in Geometry, you also explored *Rotation*).

- Translation (Slide): moving all points on a graph horizontally or vertically a fixed amount.
  - Notation:
    - Vertical Translation $f(x) + k$
    - Horizontal Translation $f(x - k)$

- Dilation (Stretch or Compression): an increase or decrease in the height (vertical dilation) or width (horizontal dilation) of a graph by a factor. For example, $y = 3x^2$ vertically stretches the parent function by a factor of 3.
  - Notation:
    - Vertical Dilation $k f(x)$
    - Horizontal Dilation $f(kx)$

- Reflection (Flip): mirroring a graph over a fixed line (typically the x-axis or y-axis).
  - Notation:
    - Vertical Reflection $-f(x)$
    - Horizontal Reflection $f(-x)$

7. For each function below, describe how the parent function $f(x) = x^2$ was transformed. The first one is done as an example.

   a. $y = x^2 - 3$ the parent function was translated 3 units down.

   b. $y = x^2 + 10$ The P. F. was translated 10 up

   c. $y = (x - 4)^2$ P. F. translated right 4

   d. $y = 0.5x^2$ P. F. compressed vertically by .5

   e. $y = (2x)^2$ P. F. compressed horizontally by 2

   f. $y = -(x - 1)^2$ (describe both transformations)
   P. F. Reflected vertically & shifted right 1.

   g. $y = 5(x + 2)^2 - 5$ (describe all transformations)
   P. F. shifted left 2, down 5, stretched vertically by 5,