Moving Parabolas Around

You may experiment on your calculator to help you answer these questions.

Review

1. These questions are about the graph of \( y=ax^2 \).
   a. What is the graph called?
   b. Where are its \( x- \) and \( y- \)intercepts?
   c. Where is its vertex?
   d. What determines whether it is a smile or a frown?
   e. How does changing \( a \) appear to change the shape of the graph?

2. These questions are about the graph of \( y=a(x-p)(x-q) \).
   a. What is this form of a quadratic function called?
   b. Where are the \( x- \) and \( y- \)intercepts? (Hint: answer in terms of \( a, p, q \).)
   c. How does one find the vertex?
   d. What determines whether the parabola is a smile or a frown?
   e. How does changing \( a \) appear to change the shape of the graph?

Moving Left and Right

3. What does the graph look like if \( p=q \)?

4. Find the equation of three parabolas whose vertex is at:
   a. \((3, 0)\) a smile, then a frown
   b. \((-2, 0)\)
   c. \((h, 0)\). Explain.

Moving Up and Down

5. These questions are about the graph of the function \( y=ax^2+c \)
   a. Where is its vertex?
   b. How is it related to the graph of \( y=ax^2 \)?

6. Find the equation of a parabola whose vertex is at:
   a. \((0, -3)\) a smile, then a frown
   b. \((0, 2)\)
   c. \((0, v)\). Explain.

Moving Anywhere

7. Find the equation of a parabola whose vertex is at:
   a. \((3, -2)\) a smile, then a frown
   b. \((-2, 3)\)
   c. \((h, v)\). Explain.

8. Tell where the vertex of these parabolas is just by looking at the formulas. Be careful about plus and minus.
   a. \( y=(x-4)^2 \)
   b. \( y=x^2+5 \)
   c. \( y=(x-4)^2+5 \)
   d. \( y=(x-4)^2-5 \)
   e. \( y=(x+4)^2+5 \)
   f. \( y=(x+4)^2-5 \)
   g. \( y=.5(x+4)^2-5 \)
   h. \( y=-.5(x+4)^2-5 \)

9. Using the format of the previous problem, write the equations of five different-looking parabolas each with vertex at \((1, 2)\). How do you change the apparent shape and the orientation?

10. This is called vertex form:
    \[ y=a(x-h)^2+v \]
    a. Where is the vertex for this parabola?
    b. What does \( a \) do?
    c. What does \( h \) do?
    d. What does \( v \) do?