Assignment

Write

Describe the connections between the vertex form of a quadratic function, $f(x) = a(x - h)^2 + k$, and the transformation form, $g(x) = A \cdot f(x - C) + D$, of the basic quadratic function, $y = f(x)$.

Remember

Transformations performed on any function $f(x)$ can be described by the transformation function $g(x) = Af(B(x + C)) + D$ where the C-value translates the function $f(x)$ horizontally, the D-value translates $f(x)$ vertically, the A-value vertically stretches or compresses $f(x)$, and the B-value horizontally stretches or compresses $f(x)$. When the A-value is negative the function $f(x)$ is reflected across a horizontal line of reflection and when the B-value is negative the function $f(x)$ is reflected across a vertical line of reflection.

Practice

1. Given $f(x) = x^2$, graph each function and write the corresponding quadratic equation.
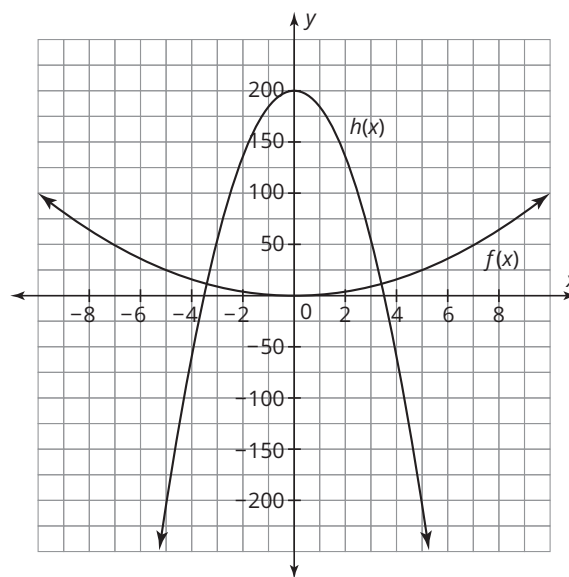   a. $g(x) = 3f(x - 1)$
   b. $g(x) = f(3x) - 1$
   c. $g(x) = \frac{1}{2}f(x) + 5$
   d. $g(x) = 2f(x - 3) + 1$
2. The graph shows the basic function $f(x) = x^2$, and also shows the function $h(x)$.
   a. Describe the types of transformations performed on $f(x)$ to result in $h(x)$.
   b. If the dilation factor is 16, write the function $h(x)$.


3. Use the given characteristics to write a function $R(x)$ in vertex form. Then, sketch the graph of $R(x)$ and the basic function $f(x) = x^2$.
   - The function has an absolute maximum.
   - The function is translated 70 units up and 100 units to the right.
   - The function is vertically dilated by a factor of $\frac{1}{5}$.
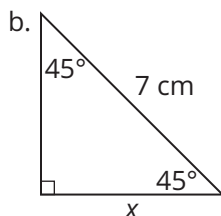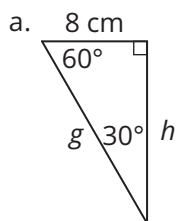
Stretch

Given $f(x) = x^2$. Sketch each function. Label point A' for each transformation.

1. $m(-x + 3)$
2. $n(-(x + 3))$
3. $r(-(x - 3))$
4. $t(-x - 3)$
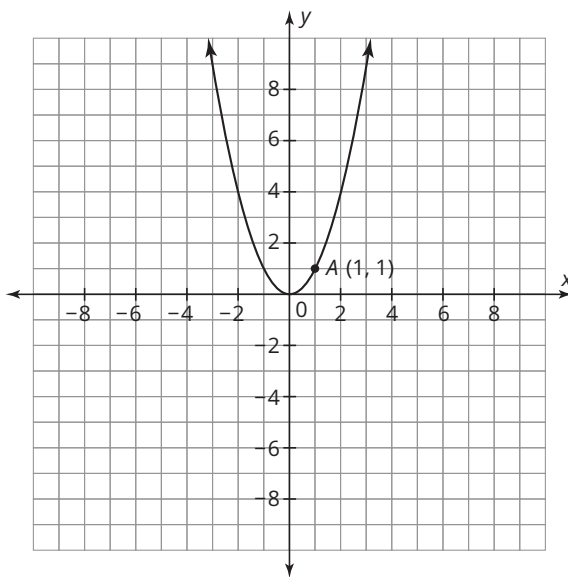
Review

1. Solve for the unknown side lengths of each figure.

a.

8 cm
60°
g 30° h

b.

45°
7 cm
45°
x

2. Use the equation $f(x) = \frac{1}{3}(x - 5)(x - 3)$ to determine each characteristic.

   a. axis of symmetry

   b. x-intercepts

   c. Will the graph open upward or downward?

3. Use the equation $f(x) = 4x^2 + 3x - 10$ to determine each characteristic.

   a. axis of symmetry   b. y-intercept