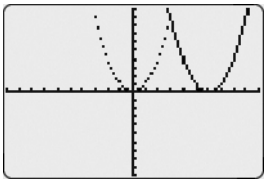
Name: _____ Date: _____

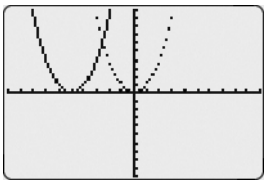
Section 4.3 The Quadratic Relation $y = a(x - h)^2$

1. In each standard viewing window, the graph of $y = x^2$ is shown as a dotted parabola, and the graph of a relation of the form $y = a(x - h)^2$ is shown as a solid parabola. For each solid parabola, identify the value of h and the coordinates of the vertex.

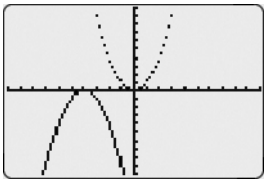
a)



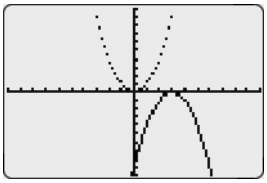
b)



c)



d)

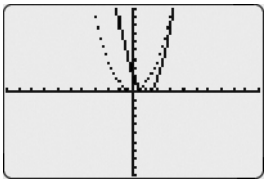


2. Describe the graph of each parabola relative to the graph of $y = x^2$ in terms of a and h. Sketch each graph.

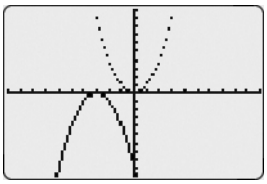
a) $y = (x + 3)^2$ **b)** $y = (x - 1)^2$
c) $y = -(x + 2)^2$ **d)** $y = 0.5(x - 4)^2$
e) $y = -2(x + 1)^2$ **f)** $y = 0.4(x - 6)^2$
g) $y = -1.5(x + 5)^2$ **h)** $y = -3(x - 2)^2$

3. In each standard viewing window, the graph of $y = x^2$ is shown as a dotted parabola. Describe the shape and position of each solid parabola relative to the graph of $y = x^2$ in terms of a and h.

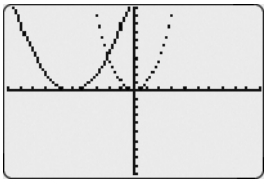
a)



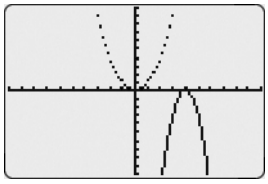
b)



c)



d)



Name: _____ Date: _____

4. Graph each relation, then write an equation in the form $y = a(x - h)^2$ that models each parabola.

a)

x	y
–3	–8
–2	–2
–1	0
0	–2
1	–8
2	–18
3	–32

b)

x	y
1	5.4
2	2.0
3	0.5
4	0.0
5	0.5
6	2.0

5. Suppose each pair of relations were graphed on the same set of axes. Which parabola would have its vertex further from the y-axis? Justify your answer.

a) $y = 0.5(x + 2)^2$ $y = 2(x - 3)^2$

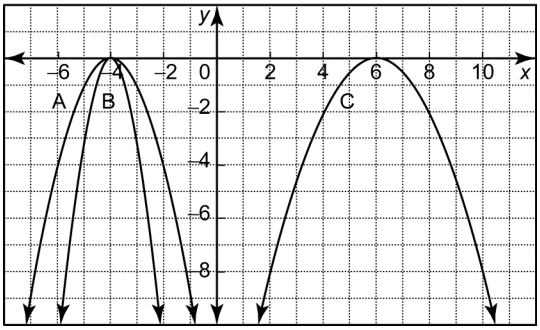
b) $y = 8(x - 5)^2$ $y = 0.3(x + 2)^2$

6. Match each relation to its corresponding graph.

a) $y = -3(x + 4)^2$

b) $y = -0.5(x - 6)^2$

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



7. In each case, the graph of $y = x^2$ is transformed as described. Write the equation of the new parabola in the form $y = a(x - h)^2$.

a) The parabola is reflected in the x-axis and translated 4 units right.

b) The parabola is compressed vertically by a factor of 0.6 and translated 2 units left.

c) The parabola is reflected in the x-axis, stretched by a factor of 2, and translated 6 units right.

d) The parabola is translated 10 units left.

8. The Roman aqueduct system in Mytilene transported water over a distance of approximately 26 km. The aqueduct system was supported by a series of parabolic arches. The shape of each arch can be modelled by the relation $y = -0.16(x - 5)^2$, where x is the horizontal distance from the base of the arch and y is the height, both in metres.

a) Graph the shape of one arch.

b) If $x = 0$ and $x = 10$ represent the points where the arches touch the ground, what is the maximum height above the ground of each arch?

c) Suppose each arch was connected to the next arch end-to-end with no gaps. How many arches would be needed to cover the 26 km distance?