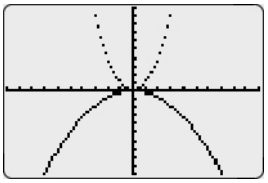
Name: _____ Date: _____

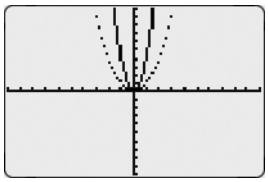
Section 4.2 The Quadratic Relation $y = ax^2 + k$

1. In each standard viewing window, the graph of $y = x^2$ is shown as a dotted parabola. The solid parabola is the graph of a quadratic relation of the form $y = ax^2$. For each solid parabola, is a less than -1, between -1 and 0, between 0 and 1, or greater than 1? Explain.

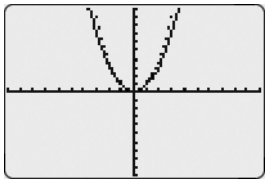
a)



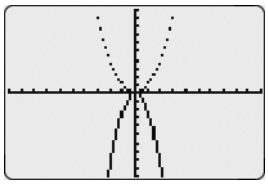
b)



c)



d)



2. Describe the shape, orientation, and vertex of each parabola relative to the graph of $y = x^2$. Sketch each graph.

a) $y = -0.5x^2 + 2$ **b)** $y = 2x^2$
c) $y = -0.1x^2 - 6$ **d)** $y = x^2 + 4$
e) $y = -3x^2 - 5$ **f)** $y = 0.1x^2 + 2$
g) $y = 8x^2 + 4$ **h)** $y = -0.7x^2 - 3$

3. Sketch each relation, then represent the relation in the form of $y = ax^2 + k$.

a)

x	y
–3	27
–2	12
–1	3
0	0
1	3
2	12
3	27

b)

x	y
–4	9
–2	3
0	1
2	3
4	9

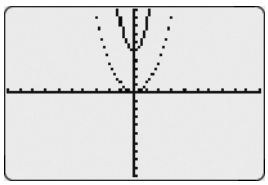
c)

x	y
–3	–22
–2	–12
–1	–6
0	–4
1	–6
2	–12
3	–22

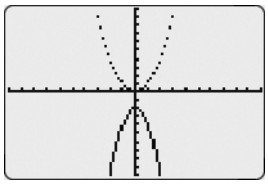
Name: _____ Date: _____

4. In each standard viewing window, the graph of $y = x^2$ is shown as a dotted parabola. The graph of a relation of the form $y = ax^2 + k$ is shown as a solid parabola. For each solid parabola, is k positive or negative? Explain.

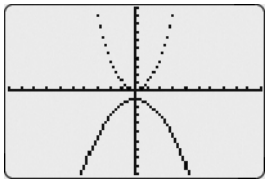
a)



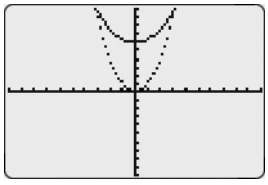
b)



c)



d)



5. Suppose each pair of relations were graphed on the same set of axes. Which parabola would:

i) be the most vertically compressed (widest)?

ii) have its vertex farther from the x-axis?

a)	$y = 3x^2$	$y = 2x^2 - 1$
b)	$y = 0.2x^2 + 3$	$y = 0.1x^2 + 1$
c)	$y = x^2 + 5$	$y = -2x^2 + 3$
d)	$y = -0.5x^2 - 6$	$y = 2x^2 + 6$
e)	$y = -x^2 + 2$	$y = -0.1x^2 - 3$
f)	$y = 0.5x^2 - 3$	$y = 2x^2 + 4$

6. The shape of the Gateway arch in St Louis, Missouri, can be modelled by the relation $h = -0.02d^2 + 192$, where h is the height of the arch and d is the distance from the centre of the arch (the y-axis), both in metres.

a) Graph the relation.

b) Find the maximum height of the arch.

c) Find the height of the arch for each horizontal distance.

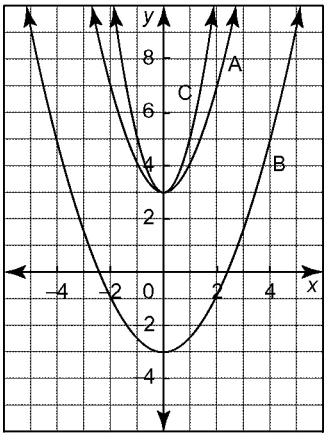
i) 20 m **ii)** 60 m **iii)** –80 m

7. Match each relation with its corresponding graph.

a) $y = 2x^2 + 3$

b) $y = 0.5x^2 - 3$

c) $y = x^2 + 3$



8. In each case, the parabola $y = x^2$ is transformed as indicated. Write the equation of the new parabola in the form $y = ax^2 + k$.

a) The parabola is stretched vertically by a factor of 4.

b) The parabola is compressed vertically by a factor of 0.3.

c) The parabola is stretched vertically by a factor of 3 and then translated up 4 units.

d) The parabola is reflected in the x-axis and then translated down 3 units.