



Algebra 2

Name: Key

Section 4-1 – Notes and Examples Date: _____ Hour: _____

Quadratic Functions and Transformations

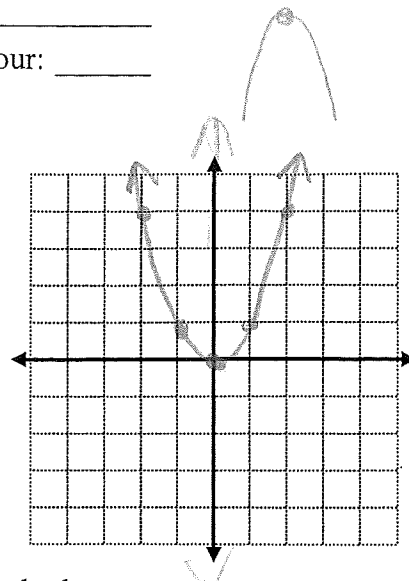
Quadratic parent function: $f(x) = x^2$

Vertex: (0,0) Axis of symmetry: X=0

Domain: all $x < \infty$ / $(-\infty, \infty)$

Range: $y \geq 0$

$f(x) = x^2$	
x	y
-2	4
-1	1
0	0
1	1
2	4



Just as there are several useful forms for linear functions (slope-intercept, standard, or point-slope), there are two common forms for quadratic functions:

Standard form: $f(x) = ax^2 + bx + c$

Vertex form: $f(x) = a(x - h)^2 + k$

The vertex of the parabola is (h, k)

Vertex form is named as such because you can identify the vertex of the parabola from the equation. Remember that the y-value of the vertex will be either the minimum or the maximum value of the function, depending on whether it opens up or down.

The following information is true for both standard form and vertex form:

$$y = c(x - b)^2 + d$$

Example 1 – Identify the vertex, the axis of symmetry, the maximum or minimum value, and the domain and range of each quadratic function. Also, fill out the table and sketch the graph.

a. $f(x) = 3(x - 4)^2 - 2$

Vertex: (4, -2)

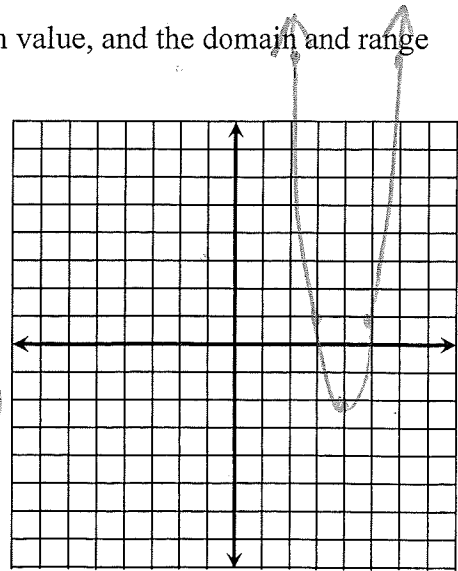
AOS: X=4

Max / Min: (Min)

Domain: all

Range: $y \geq -2$

$y = x^2$		$x + 4$		$y \cdot 3$		$y - 2$	
x	y	x	y	x	y	x	y
-2	4	2	4	2	12	2	10
-1	1	3	1	3	3	3	1
0	0	4	0	4	0	4	-2
1	1	5	1	5	3	5	1
2	4	6	4	6	12	6	10



b. $f(x) = -2(x+1)^2 + 4$

Vertex: $(-1, 4)$

AOS: $x = -1$

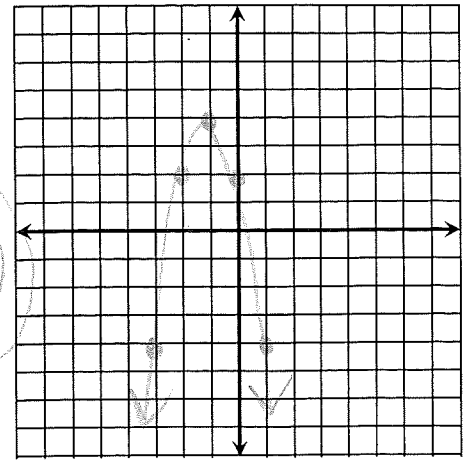
Max/Min: _____

Domain: all

Range: $y \leq 4$

Range: _____

$y = x^2$		$x - 1$		$y(-2)$		$y + 4$	
x	y	x	y	x	y	x	y
-2	4	-3	4	-3	-8	-3	-4
-1	1	-2	1	-2	-2	-2	2
0	0	-1	0	-1	0	-1	4
1	1	0	1	0	-2	0	2
2	4	1	4	1	-8	1	-4



c. $y = -\frac{1}{2}(x+2)^2 - 1$

Vertex: $(-2, -1)$

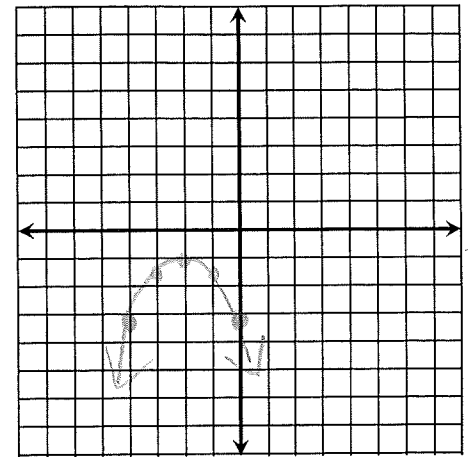
AOS: $x = -2$

Max/Min: _____

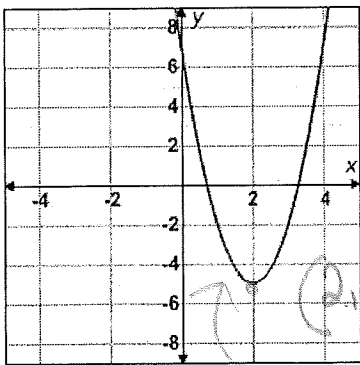
Domain: all

Range: $y \leq -1$

$y = x^2$		$x - 2$		$-\frac{1}{2}y$		$y - 1$	
x	y	x	y	x	y	x	y
-2	4	-4	4	-4	-2	-4	-3
-1	1	-3	1	-3	-1/2	-3	-1 1/2
0	0	-2	0	-2	0	-2	-1
1	1	-1	1	-1	-1/2	-1	-1 1/2
2	4	0	4	0	-2	0	-3



Example 3 – Write a quadratic function to model the graph. The y-intercept is $(0, 7)$.



$$f(x) = a(x - h)^2 + k$$

$$7 = a(0 - 2)^2 - 5$$

$$7 = 4a - 5$$

$$12 = 4a$$

$$3 = a$$

$$y = 3(x - 2)^2 - 5$$

Example 4 – Given a vertex at $(3, 7)$ and another ordered pair of $(9, 4)$ on a parabola, write the equation of the parabola in vertex form.

h k

$$f(x) = a(x - h)^2 + k$$

$$4 = a(9 - 3)^2 + 7$$

$$4 = 36a + 7$$

$$-3 = 36a$$

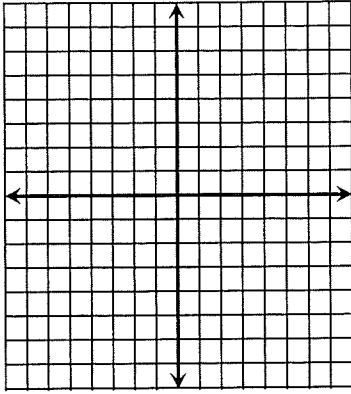
$$-1/12 = a$$

$$f(x) = -\frac{1}{12}(x - 3)^2 + 7$$

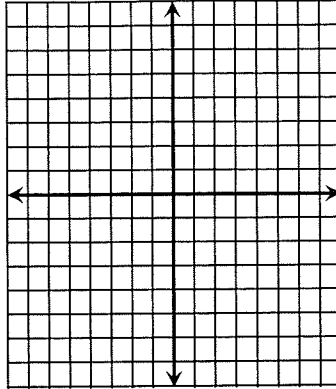
$$f(x) = a(x - h)^2 + k$$

Graph each function:

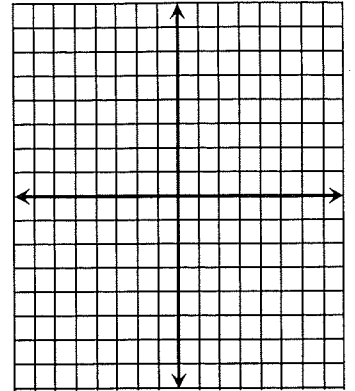
1. $y = 4x^2$



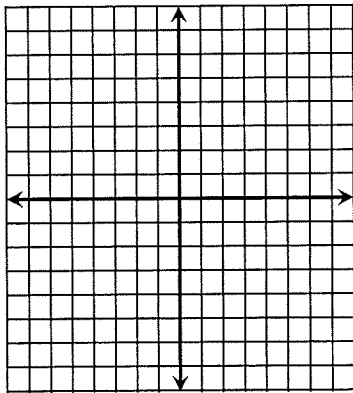
2. $y = -3x^2$



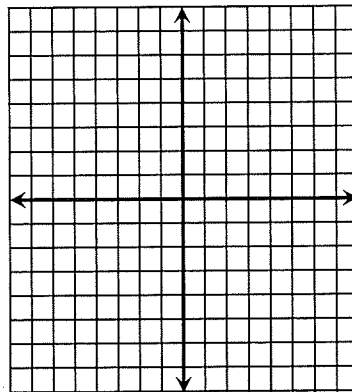
3. $y = -\frac{1}{2}x^2$



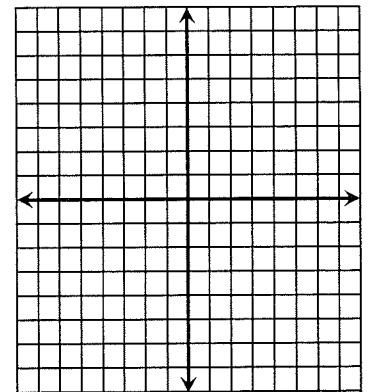
4. $f(x) = x^2 + 4$



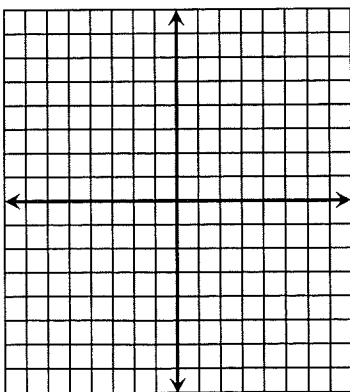
5. $f(x) = x^2 - 6$



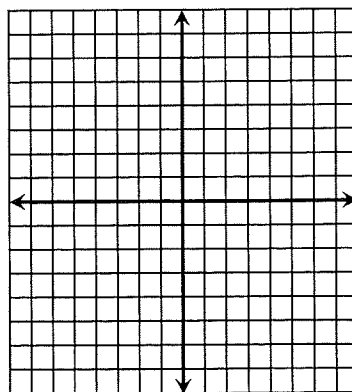
6. $y = x^2 - 2$



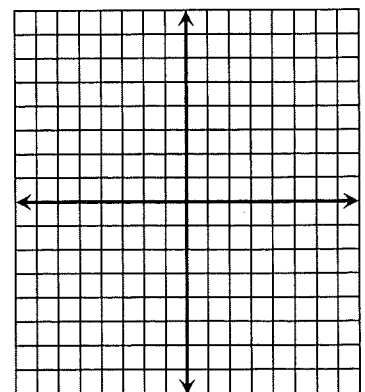
7. $f(x) = (x - 5)^2$



8. $f(x) = (x + 3)^2$



9. $f(x) = (x + 1)^2$



Identify the vertex, the axis of symmetry, the maximum or minimum value, and the domain and range of each quadratic function. Also, fill out the table and sketch the graph.

10. $f(x) = -2(x-1)^2 + 3$

Vertex: _____

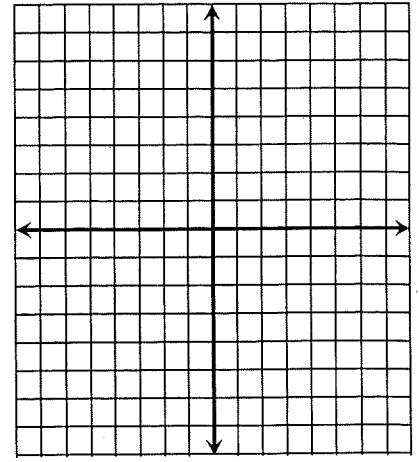
AOS: _____

Max / Min: _____

Domain: _____

Range: _____

x	y



11. $y = -2(x-2)^2 + 5$

Vertex: _____

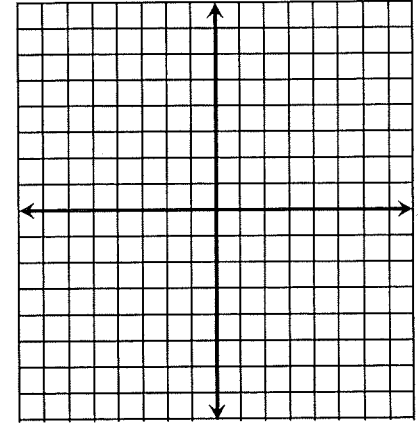
AOS: _____

Max / Min: _____

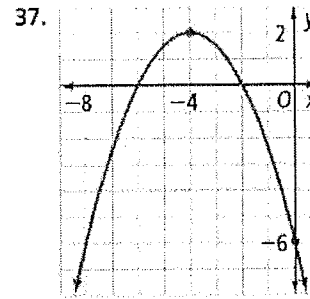
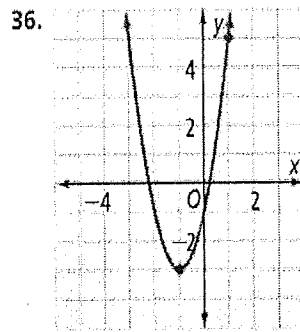
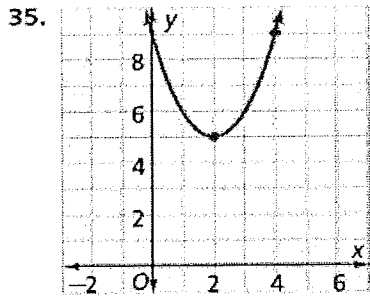
Domain: _____

Range: _____

x	y



Homework: Write a quadratic function to model the graph.



Write the equation of the parabola in vertex form.

49. vertex (1, 2), point (2, -5)

50. vertex (-3, 6), point (1, -2)

51. vertex (0, 5), point (1, -2)