

Section 9.1: Graphing Quadratic Functions in Vertex Form



CHAPTER 9: QUADRATIC FUNCTIONS

Skill Test: a few still have not passed



- Solving systems of equations
- Exponent rules: Section 7.4, 10.1
- Homework sets to build skills
 - Systems of Equations
 - Exponents
 - Adding signed numbers
 - Combining Like Terms and Distribution
- These will not affect your grade, if you don't do them or don't finish them

Chapter 8: factoring and solving quadratics



- Factor to solve: must equal zero BEFORE factoring—makes use of zero factor property
- Solve from table: read value given, find other
- Solve from graph: same as above
- Remember:
 - $f(x) = y$, so $f(x) = 3$, substitute on 'y' side
 - $f(3)$ means $x = 3$

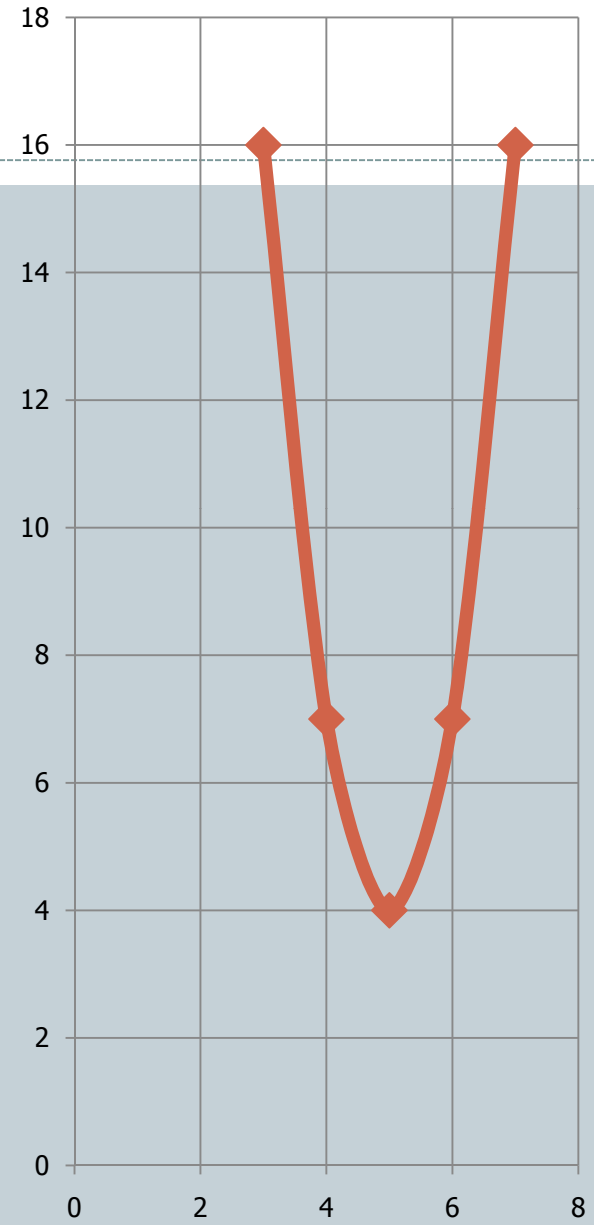
Chapter 9: Quadratic Functions



- **Parabola:** symmetric curve that is graph of quadratic function
- **Vertex:** 'end' of graph of quadratic
 - May be minimum range: $y \geq \text{vertex}$
 - May be maximum range: $y \leq \text{vertex}$
 - Other 'end' doesn't end: goes to ∞
- **Axis of symmetry:** line for which points of graph are equal distance to left and right

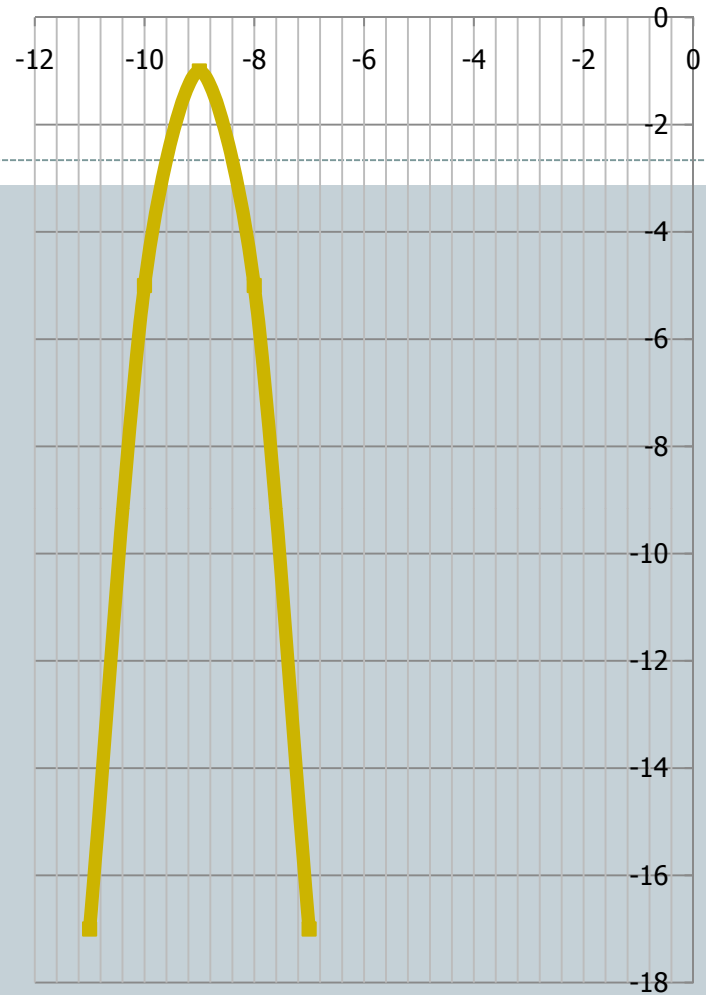
$$3(x-5)^2 + 4$$

- Vertex is minimum
- (5,4)
- Line of symmetry
- $x = 5$



$$-4(x+9)^2-1$$

- Vertex is maximum
- $(-1, -9)$
- Line of symmetry
- $x = -9$



Graph these functions

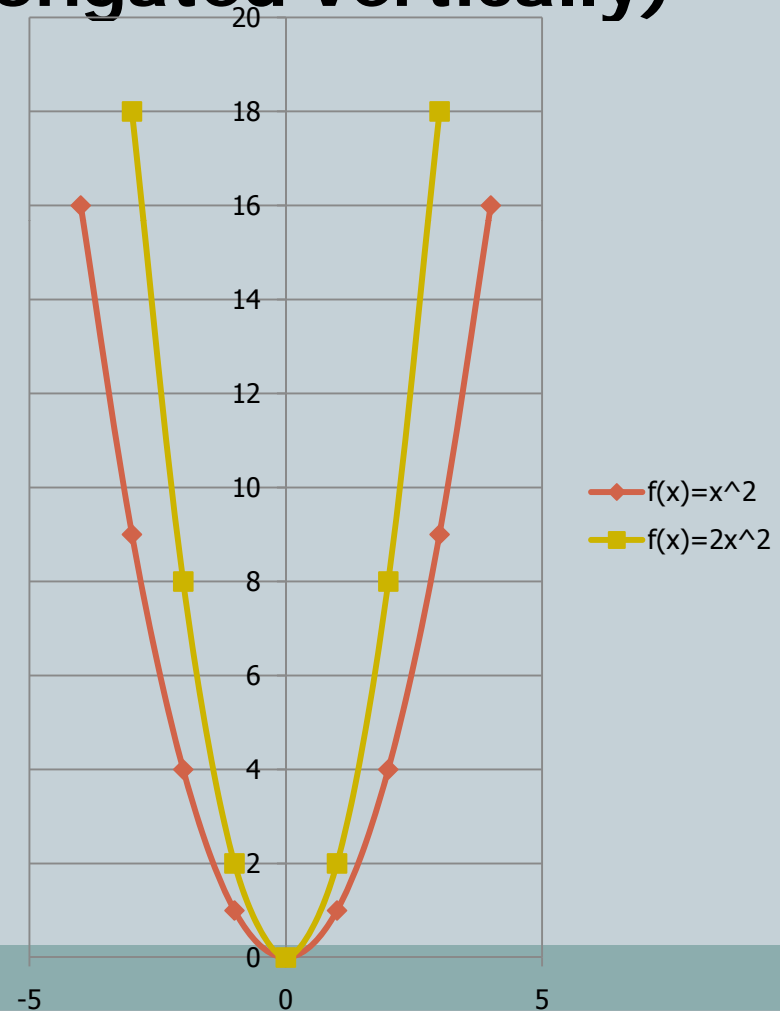


x	$f(x)=x^2$	$f(x)=2x^2$
-3	9	18
-2	4	8
-1	1	2
0	0	0
1	1	2
2	4	8
3	9	18

Relationship of $f(x)=x^2$ and $f(x)=2x^2$



- $f(x)=2x^2$ is stretched (elongated vertically) compared to $f(x)=x^2$



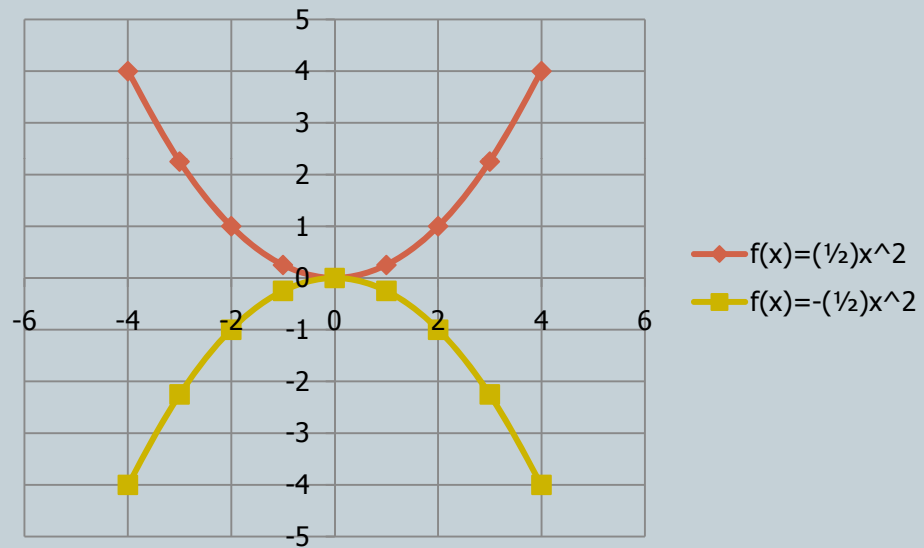
Graph these

x	$f(x) = (\frac{1}{2})x^2$	$f(x) = -(\frac{1}{2})x^2$
-4	4	-4
-3	2.25	-2.25
-2	1	-1
-1	0.25	-0.25
0	0	0
1	0.25	-0.25
2	1	-1
3	2.25	-2.25
4	4	-4

$$f(x) = \left(\frac{1}{2}\right)x^2, \quad f(x) = -\left(\frac{1}{2}\right)x^2$$



- Reflected across x axis

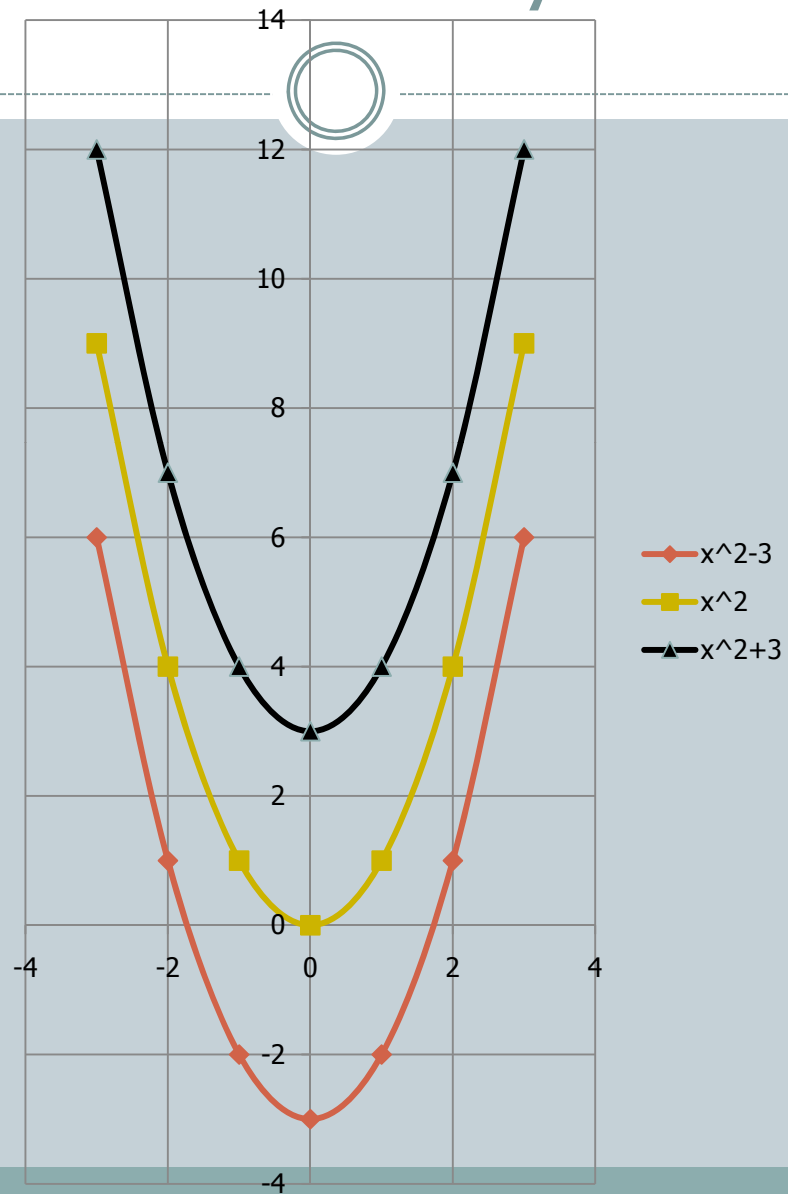


Graph these



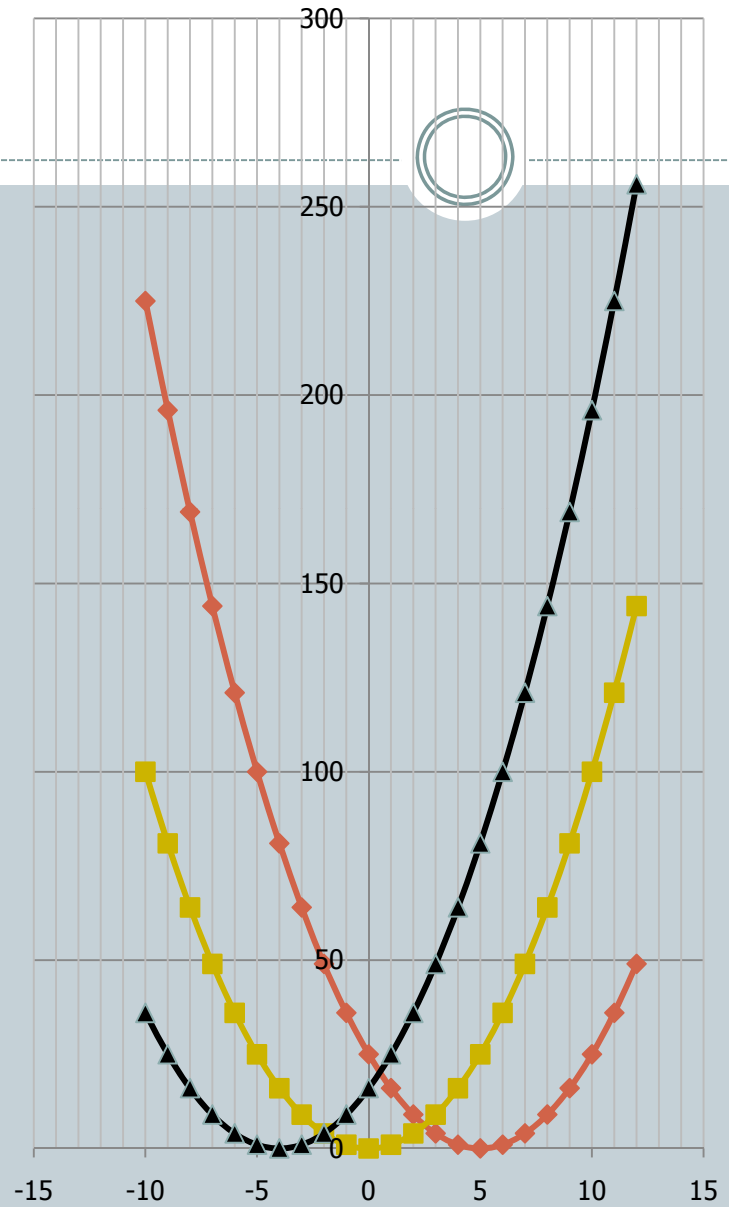
x	$Y_1 = x^2 - 3$	$Y_2 = x^2$	$Y_3 = x^2 + 3$
-3	6	9	12
-2	1	4	7
-1	-2	1	4
0	-3	0	3
1	-2	1	4
2	1	4	7
3	6	9	12

Value translates in y direction



Graph these

x	$(x-5)^2$	x^2	$(x+4)^2$
-10	225	100	36
-9	196	81	25
-8	169	64	16
-7	144	49	9
-6	121	36	4
-5	100	25	1
-4	81	16	0
-3	64	9	1
-2	49	4	4
-1	36	1	9
0	25	0	16
1	16	1	25
2	9	4	36
3	4	9	49
4	1	16	64
5	0	25	81
6	1	36	100
7	4	49	121
8	9	64	144
9	16	81	169
10	25	100	196
11	36	121	225
12	49	144	256



- $(x-5)^2$
- x^2
- $(x+4)^2$

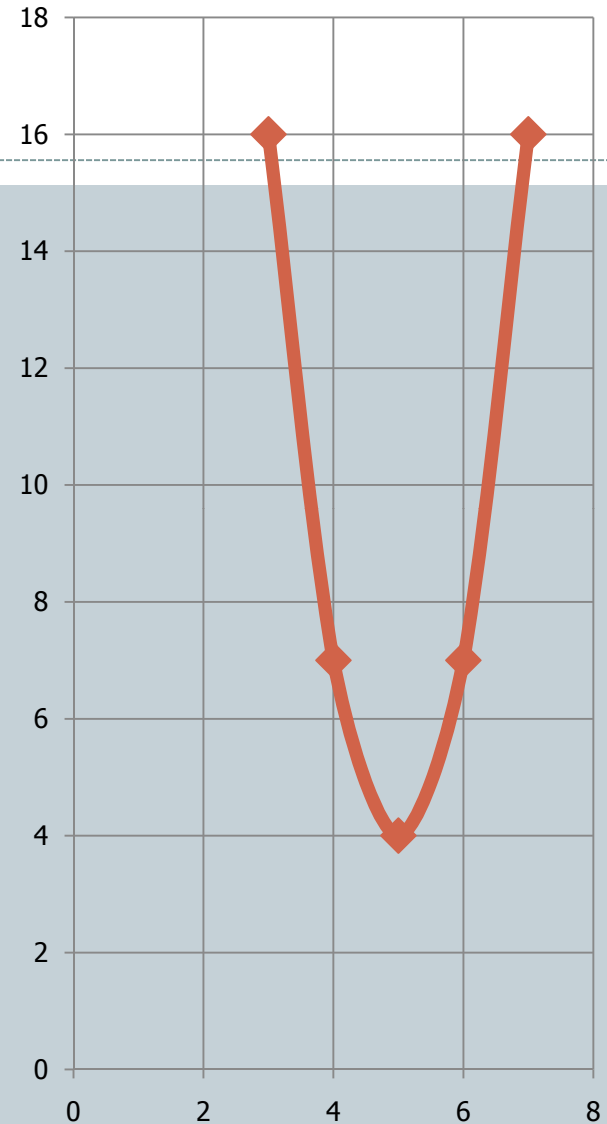
Generalizations: $a(x - h)^2 + k$



- Coefficient a affects direction and width of parabola
- Value h subtracted from x moves parabola right and left
- Value k added to other term moves parabola up and down
- (h, k) is the VERTEX of the parabola
- $x = h$ is the line of symmetry of the parabola

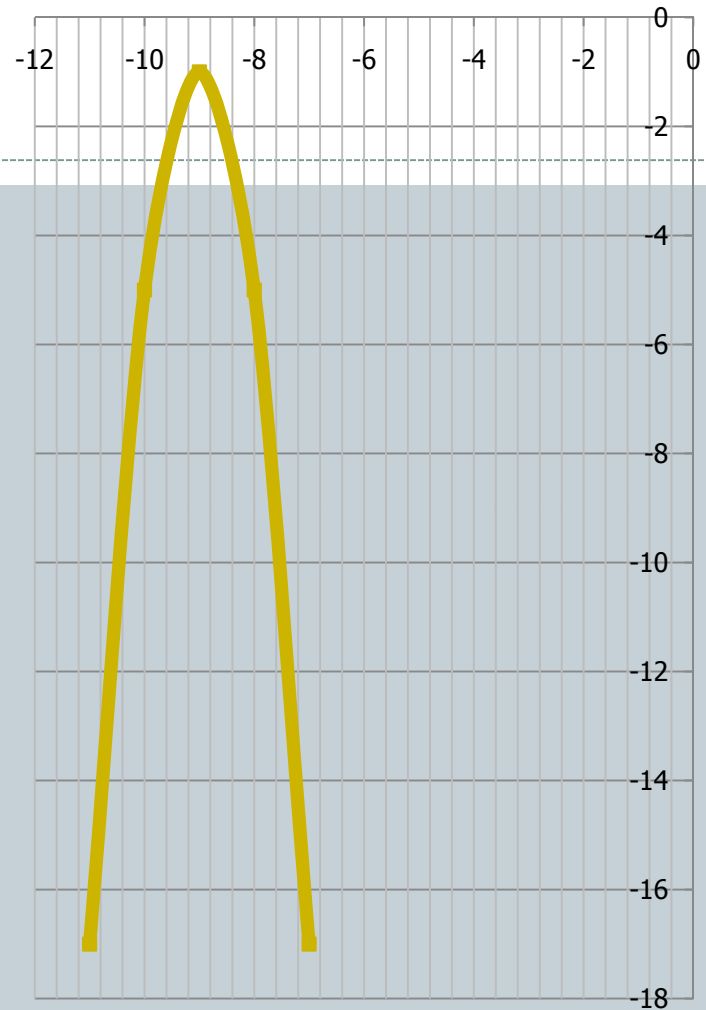
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Predict the graphs



$$\frac{1}{3}(x-5)^2 + 3$$

$$(x+3)^2 + 1$$

$$-2(x+6)^2 - 2$$

$$-\frac{1}{2}(x+4)^2 - 2$$