8.4 Notetaking with Vocabulary

Standard form of quadratic $y = ax^2 + bx + c$

I can identify even and odd functions.

I can graph quadratic functions using transformations. – using vertex form

Write the meaning of each vocabulary term.

vertex form (of a quadratic function)

reflect, stretch, compress

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

horizontal shift

vertical shift

Core Concepts

Even and Odd Functions

If (x, y) is on the curve, then $(-x, y)$ is also on curve

A function $y = f(x)$ is even when $f(-x) = f(x)$ for each x in the domain of f.
The graph of an even function is symmetric about the y-axis. (line)

If (x, y) is on curve, then $(-x, -y)$ is on the curve.

A function $y = f(x)$ is odd when $f(-x) = -f(x)$ for each x in the domain of f.
The graph of an odd function is symmetric about the origin. (point)

A graph is symmetric about the origin when it looks the same after reflections in the x-axis and then in the y-axis.

Graphing $f(x) = a(x - h)^2 + 0$

$k = 0$

see negative

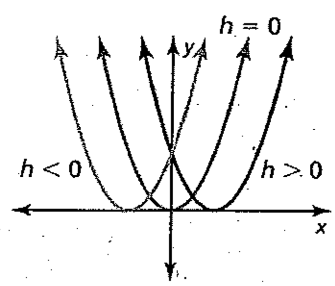
Ex. $f(x) = 5(x-2)^2$ $h = 2$
Vertex $(2, 0)$ $x = 2$ AoS

- When $h > 0$ (+), the graph of $f(x) = a(x - h)^2$ is a horizontal shift/translation h units right of the graph $f(x) = ax^2$.

see plus

Ex. $f(x) = 6(x+3)^2$ $h = -3$
$= 6(x - -3)^2$
$(-3, 0)$

- When $h < 0$ (−), the graph of $f(x) = a(x - h)^2$ is a horizontal shift h units left of the graph of $f(x) = ax^2$.



The vertex of the graph of $f(x) = a(x - h)^2$ is $(h, 0)$

and the axis of symmetry is $x = h$.

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8.4 **Notetaking with Vocabulary** (continued)

reflections, compressions, stretches

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

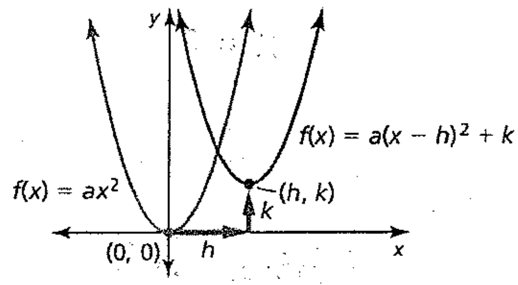
vertical shift

horizontal shift

The vertex form of a quadratic function is

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

where $a \neq 0$.



The graph of $f(x) = a(x-h)^2 + k$ is a shift h units left/right and k units up/down of the graph of $f(x) = ax^2$.

The vertex of the graph of $f(x) = a(x - h)^2 + k$ is (h, k) and the AoS is $x = h$.

Practice

$f(-x) = f(x)$

$f(-x) = -f(x)$

In Exercises 1–4, determine whether the function is ***even, odd,*** **or** ***neither.*** Substitute $-x$ in for x.

1. $f(x) = 5x$

$f(-x) = 5(-x)$

$f(-x) = -5x$ not even

$-f(x) = -(5x)$

$-f(x) = -5x$

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

3. $h(x) = \frac{1}{2}x^2$

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

(h,k) $\qquad y = a(x-h)^2 + k$

In Exercises 5–8, find the vertex and the axis of symmetry of the graph of the function.

5. $f(x) = 5(x-2)^2 + 0$

vertex $(2,0)$

$x = 2$

6. $f(x) = -4(x+8)^2$

vertex $(-8,0)$

$x = -8$

7. $p(x) = -\frac{1}{2}(x-1)^2 + 4$

vertex $(1,4)$

$x = 1$

8. $g(x) = -(x+1)^2 - 5$

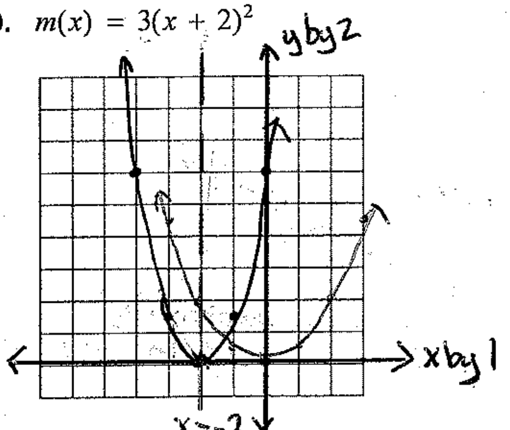
vertex $(-1,-5)$

$x = -1$ $\qquad (h,k)$

In Exercises 9 and 10, $\boxed{\text{graph}}$ the function. $\boxed{\text{Compare}}$ the graph to the graph of $f(x) = x^2$.

$a = 3 \quad h = -2 \quad k = 0$ $\qquad a = \frac{-1}{4} \quad h = 6 \quad k = 4$ ↓

↑ **9.** $m(x) = 3(x+2)^2$



vertex $(-2,0)$

$x = -2$

Need 2 more points

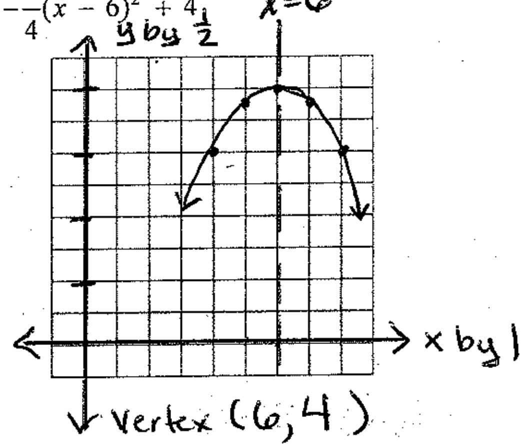
x	$m(x)$
-2	0 vertex
-1	3
0	12

$m(-1) = 3(-1+2)^2$
$= 3(1)^2$
$= 3$

$m(0) = 3(0+2)^2$
$= 3(2)^2$
$= 12$

$m(x)$ is a vertical stretch and a shift left 2 of $f(x)$.

10. $g(x) = -\frac{1}{4}(x-6)^2 + 4$



vertex $(6,4)$

$x = 6$

Need 2 more points

x	$g(x)$
6	4
4	3
5	$3\frac{3}{4}$

$g(4) = \frac{-1}{4}(4-6)^2 + 4$
$= \frac{-1}{4}(-2)^2 + 4$
$= \frac{-1}{4}(4) + 4$
$= -1 + 4 = 3$

$g(5) = \frac{-1}{4}(5-6)^2 + 4$
$= \frac{-1}{4}(-1)^2 + 4$
$= \frac{-1}{4} + 4 = 3\frac{3}{4} = 3.75$