

Transformations & Graphing from Vertex Form

Apr. 15/2016

vertex form:  $y = a(x - h)^2 + k$ 

**a** tells us if there is a (1) **vertical reflection**  
and any (2) **vertical scaling** (stretch or compression)

**h** is the **x-coordinate** of the vertex, which corresponds  
to a (3) **horizontal shift** (left or right).

**k** is the **y-coordinate** of the vertex, which corresponds  
to a (4) **vertical shift** (up or down).

Note: Always read transformations from left to right.

Mar 20 - 4:17 PM

To graph, choose a strategy:

## 1. Table of Values

- starting method for any graph
- try to choose x-values around axis of symmetry
- calculate y-values and plot points

## 2. Transformations

- determine transformations in correct order
- apply transformations to key points from  $y = x^2$

## 3. Vertex &amp; Step Pattern

- determine location of vertex
- determine step pattern compared to  $y = x^2$
- note direction of opening (vertical reflection?)
- build parabola starting at vertex

Nov 13-9:57 PM

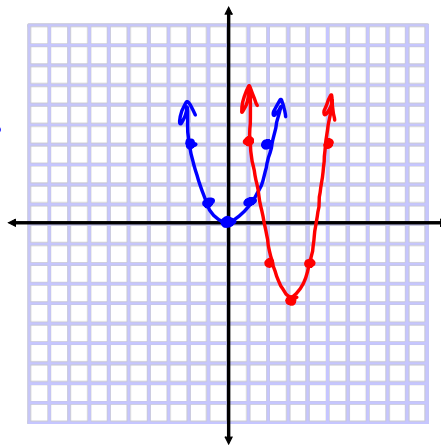
Ex.1 Graph  $y = 2(x - 3)^2 - 4$  by transforming points from  $y = x^2$ .

- ① v. stretch by 2
- ② h. shift right by 3
- ③ v. shift down by 4

- ①  $y \times 2$
- ②  $x + 3$
- ③  $y - 4$

key points

$(0,0)$	$\xrightarrow{y \times 2}$	$(0,0)$	$\xrightarrow{x+3}$	$(3,0)$	$\xrightarrow{y-4}$	$(3,-4)$
$(1,1)$	$\longrightarrow$	$(1,2)$	$\longrightarrow$	$(4,2)$	$\longrightarrow$	$(4,-2)$
$(2,4)$	$\longrightarrow$	$(2,8)$	$\longrightarrow$	$(5,8)$	$\longrightarrow$	$(5,4)$
$(-1,1)$	$\longrightarrow$	$(-1,2)$	$\longrightarrow$	$(2,2)$	$\longrightarrow$	$(2,-2)$
$(-2,4)$	$\longrightarrow$	$(-2,8)$	$\longrightarrow$	$(1,8)$	$\longrightarrow$	$(1,4)$



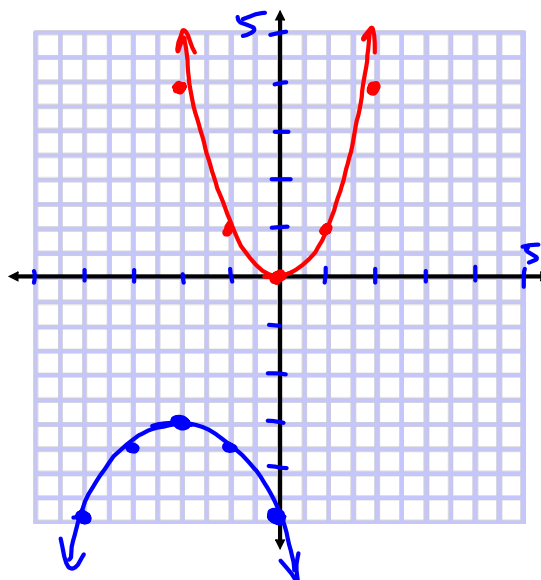
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Ex.2 Graph  $y = -0.5(x + 2)^2 - 3$  using the vertex and step pattern.

$V(-2, -3)$

step: 1, 3, 5, 7, ...

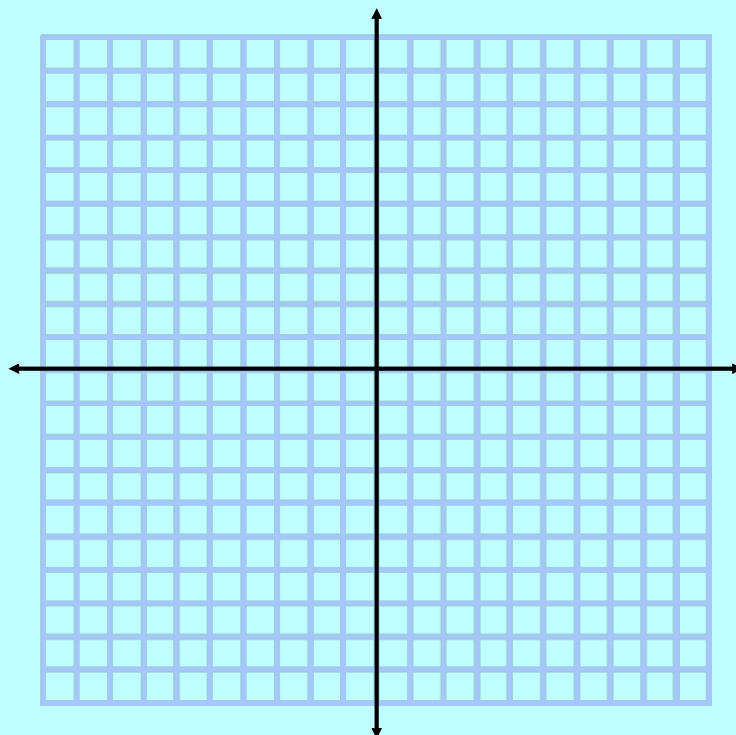
$x(-0.5)$				
	$\downarrow$	$\downarrow$	$\downarrow$	$\downarrow$
	$-0.5$	$-1.5$	$-2.5$	$-3.5$
		GR		
	$-\frac{1}{2}$	$-\frac{3}{2}$	$-\frac{5}{2}$	$-\frac{7}{2}$



Nov 13-10:04 PM

State the vertex and step pattern, then graph.

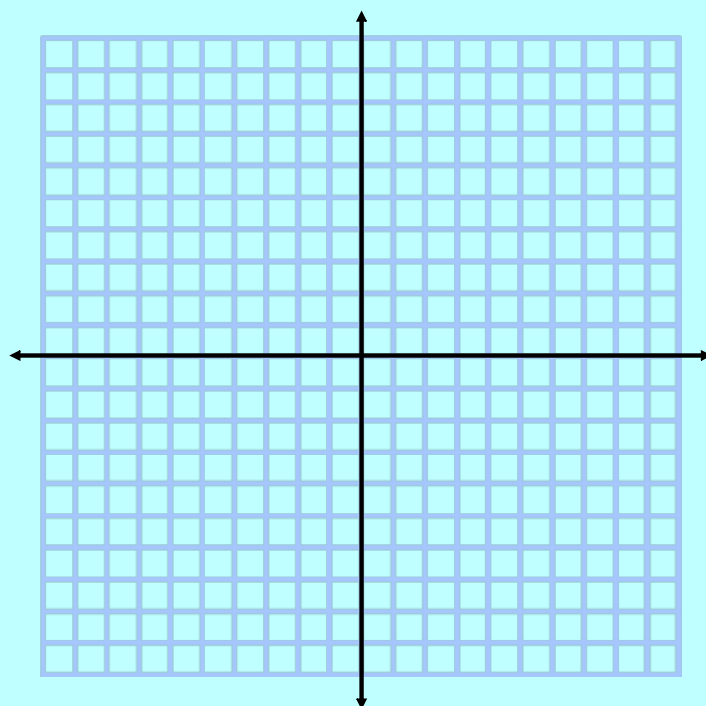
(a)  $y = -(x - 5)^2 + 4$  Vertex \_\_\_\_\_ Step \_\_\_\_\_



Apr 27-8:34 PM

State the vertex and step pattern, then graph.

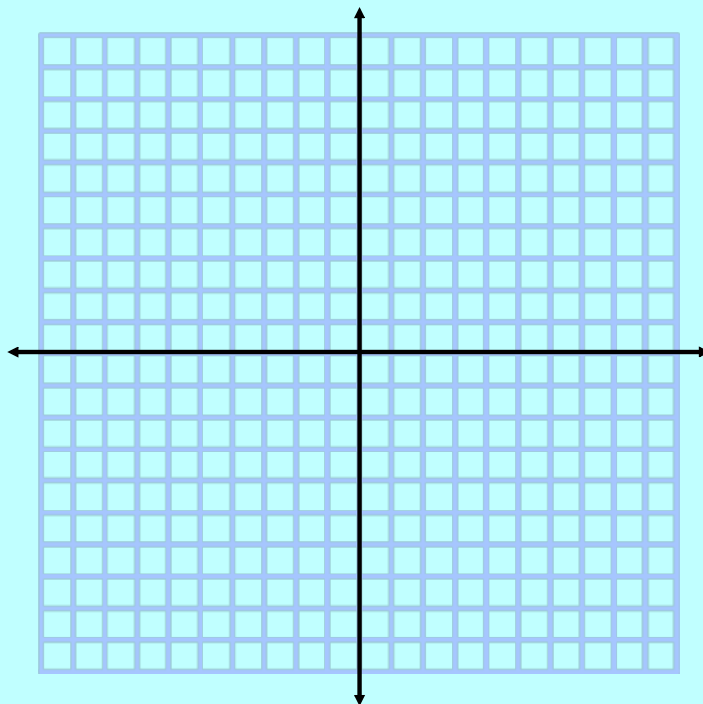
(b)  $y = 0.5(x + 3)^2 - 8$  Vertex \_\_\_\_\_ Step \_\_\_\_\_



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State the vertex and step pattern, then graph.

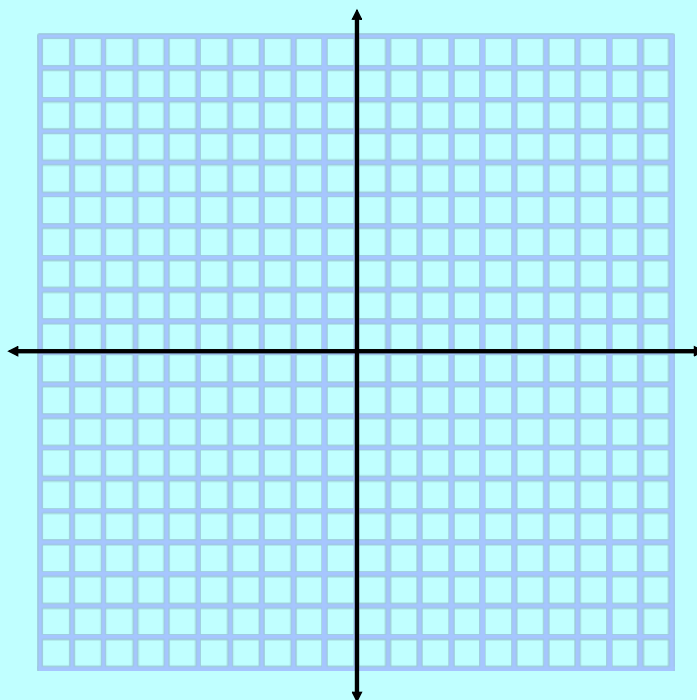
(c)  $y = -2(x - 6)^2 + 4$  Vertex \_\_\_\_\_ Step \_\_\_\_\_



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State the vertex and step pattern, then graph.

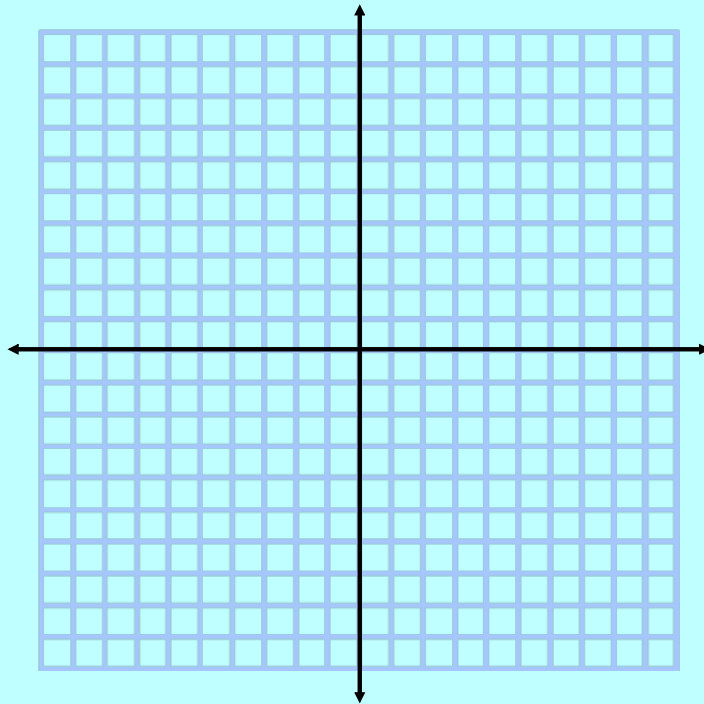
(d)  $y = 3(x + 5)^2 - 2$  Vertex \_\_\_\_\_ Step \_\_\_\_\_



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State the vertex and step pattern, then graph.

(e)  $y = -(x - 4)^2 + 5$  Vertex \_\_\_\_\_ Step \_\_\_\_\_

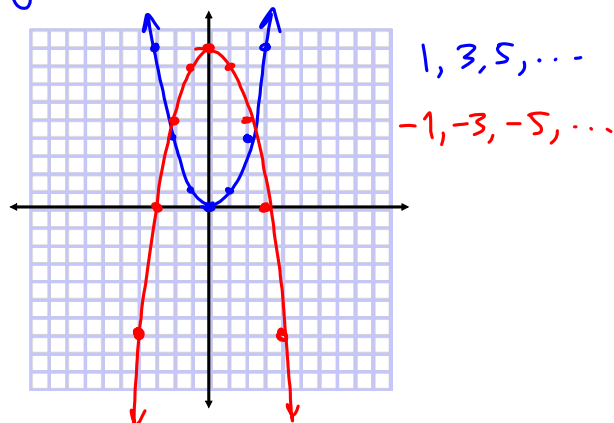


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Assigned Work:

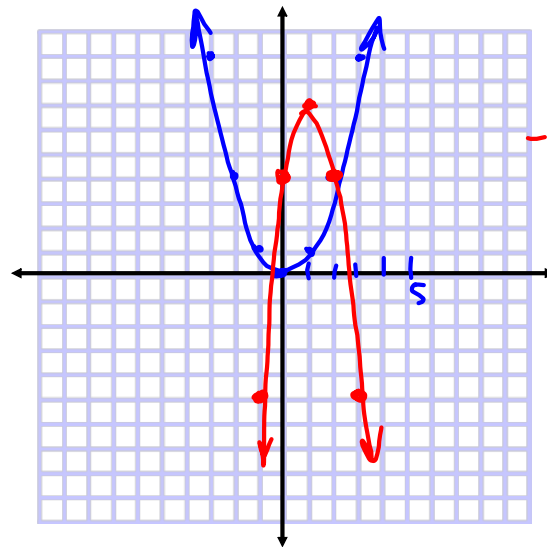
- p.269 # 1 - 3 (basics)
- # 4odd, 5odd, 6, 7odd
- # 10, 11, 13, 14, 15
- a*                      *a*
- 5a, 7c*

5(a)  $y = -x^2 + 9$  →  $V(0, 9)$



Nov 10-8:41 AM

$$7(c) \quad y = -3(x-1)^2 + 7 \quad V(1, 7)$$



1, 3, 5, 7, ...

-3, -9, -15, ...

Apr 18-2:01 PM

$$10(a) \quad h = -0.5(g-r)t^2 + k$$

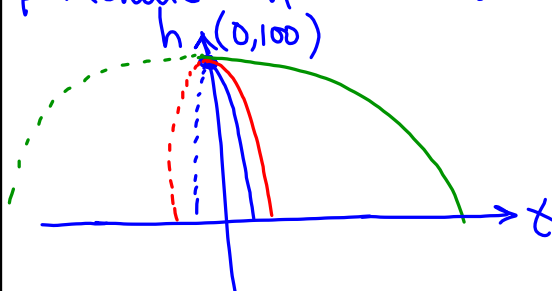
$$g = 9.8$$

$$\text{sheet: } h = -0.5(9.8 - 0.6)t^2 + 100$$

$$r = 0.6 \quad h = -4.6t^2 + 100$$

$$\text{tarp: } h = -3.85t^2 + 100$$

$$\text{parachute: } h = -0.45t^2 + 100$$



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$$14(a) \quad h = -5(t-4)^2 + 2500$$

$$V(4, 2500)$$

(a) delay of 4 seconds.

(b) initial height 2500m

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