

Transformations & Graphing from Vertex Form

Nov 14/2011

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

1,2 3 4

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 & 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

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

y ① v. stretch by 2
 x ② shift right by 3
 y ③ shift down 4

$y = x^2$
 $y = 4$

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

x	$y = x^2$
-2	4
-1	1
0	0
1	1
2	4

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

vertex: $(-2, -3)$

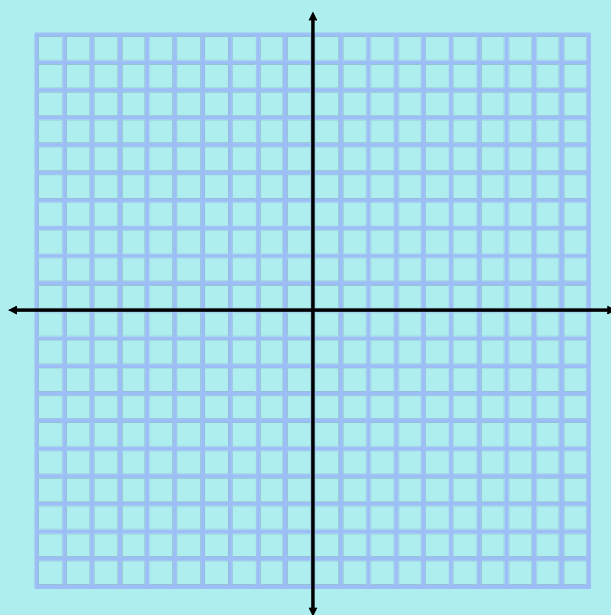
$y = x^2: 1, 3, 5, \dots$
 $x a \quad x a \quad x a$
 $-0.5, -1.5, -2.5, \dots$
 ↓
 1 square
 ↓
 3 sq.
 ↓
 5 sq.

$y = x^2$
 $y = -0.5(x + 2)^2 - 3$

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State the vertex and step pattern, then graph.

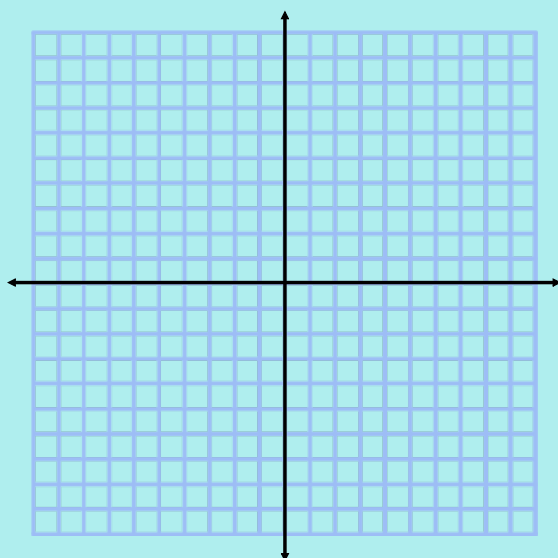
(a) $y = -(x - 5)^2 + 4$ Vertex _____ Step _____



Apr 27-8:34 PM

State the vertex and step pattern, then graph.

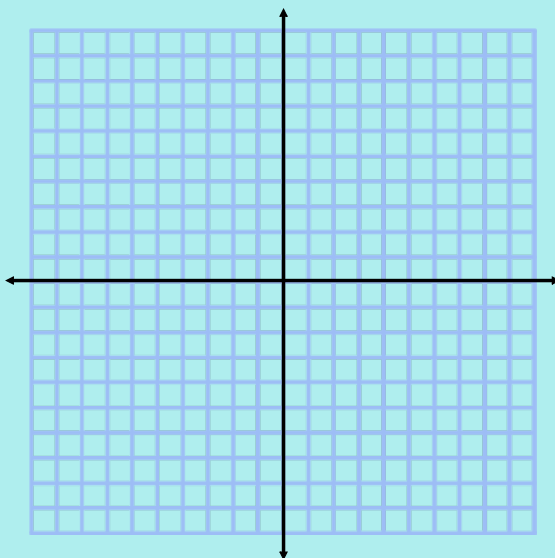
(b) $y = 0.5(x + 3)^2 - 8$ Vertex _____ Step _____



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State the vertex and step pattern, then graph.

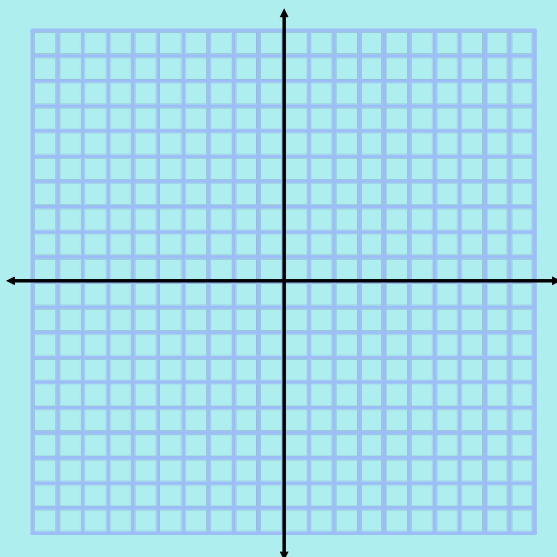
(c) $y = -2(x - 6)^2 + 4$ Vertex _____ Step _____



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State the vertex and step pattern, then graph.

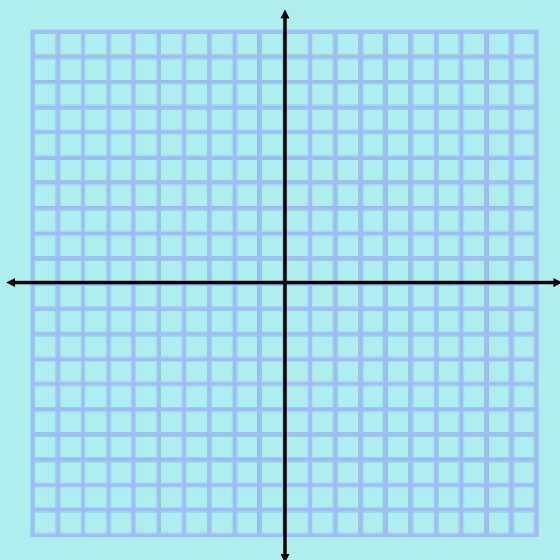
(d) $y = 3(x + 5)^2 - 2$ Vertex _____ Step _____



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State the vertex and step pattern, then graph.

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

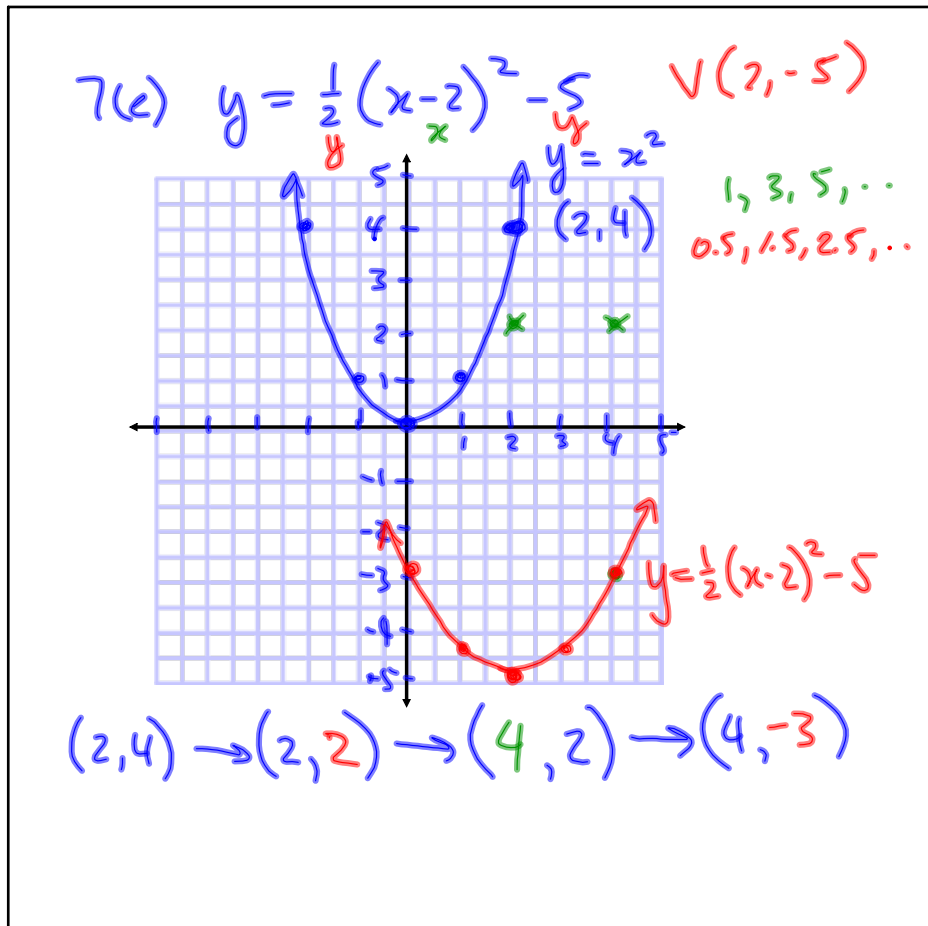


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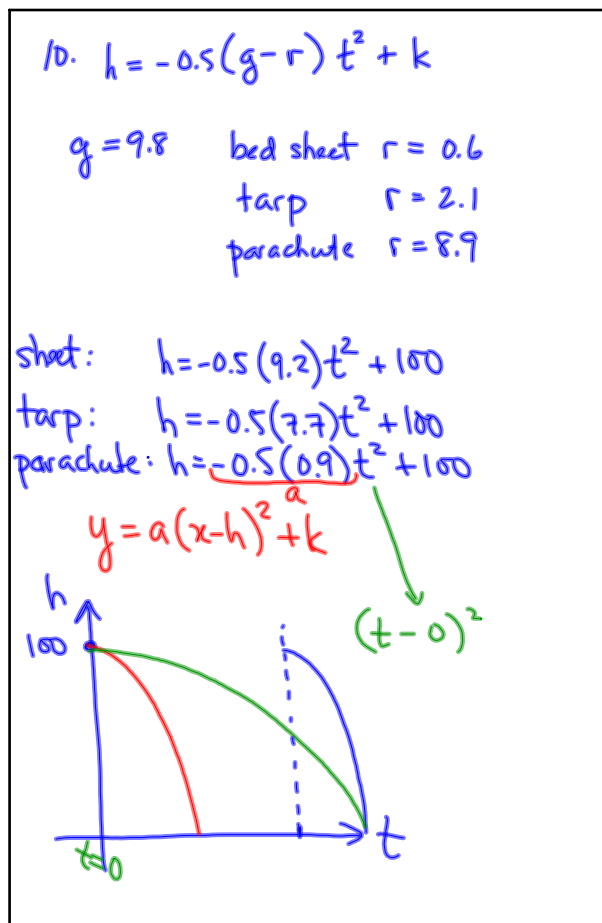
Assigned Work:

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

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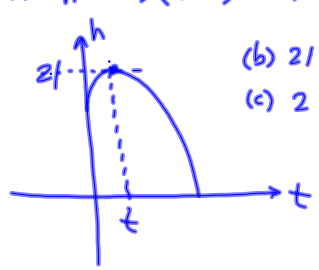


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Nov 15-9:21 AM

15. $h = -5(t-2)^2 + 21$ $V(2, 21)$



(b) 21 m
(c) 2 s

(c) $h = 10$ m ?

$$10 = -5(t-2)^2 + 21$$

$$\begin{array}{r} -21 \\ -11 = -5(t-2)^2 \end{array}$$

$$\begin{array}{r} -5 \\ -5 \end{array} \quad \begin{array}{r} -21 \\ -21 \end{array}$$

$$2.2 = (t-2)^2 \quad x^2 = 4$$

$$\pm\sqrt{2.2} = t-2 \quad x = \pm\sqrt{4}$$

$$\begin{array}{l} \sqrt{2.2} = t-2 \\ +2 \quad +2 \\ 2+\sqrt{2.2} = t \\ t \doteq 3.5 \end{array} \quad \begin{array}{l} -\sqrt{2.2} = t-2 \\ 2-\sqrt{2.2} = t \\ t \doteq 0.6 \end{array}$$

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