Translations of a Quadratic Relation

Nov. 11/2011

1. factored form: $y = a(x - s)(x - t)$

2. standard form: $y = ax^2 + bx + c$

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

a tells us the direction of opening (up or down),
and any vertical scaling (stretch or compression)

h is the x-coordinate of the vertex.

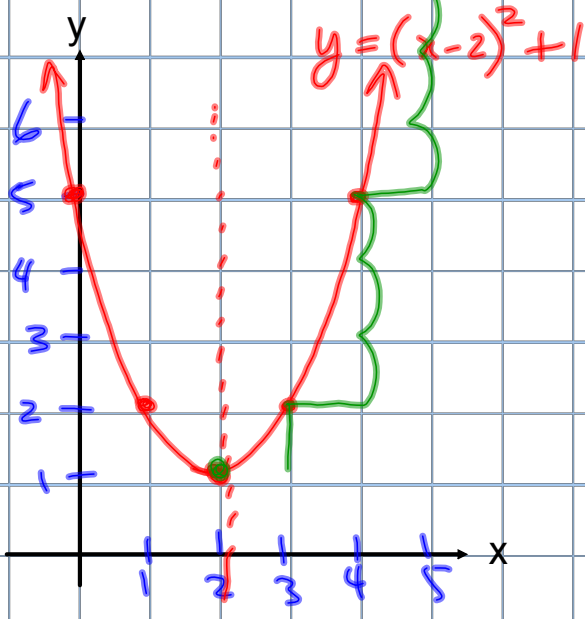
k is the y-coordinate of the vertex.

Mar 20 - 4:17 PM

Ex.1 Graph $y = (x - 2)^2 + 1$ using a TOV.

x	y
0	$(0-2)^2+1 = 5$
1	$(1-2)^2+1 = 2$
2	$(2-2)^2+1 = 1$
3	$(3-2)^2+1 = 2$
4	$(4-2)^2+1 = 5$

vertex is (2, 1)



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The vertex of the parent function, $y = x^2$, is (0, 0).

If the vertex has moved from (0, 0) to (h, k) then the graph has been

translated vertically by k (up or down)

and horizontally by h (left or right)

Vertex Form: $y = a(x - h)^2 + k$

sign changes

sign stays the same.

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Ex.2 State the coordinates of the vertex and direction of opening.

(a) $y = (x - 5)^2 + 4$ Vertex (5, 4) Opens up

(b) $y = (x + 3)^2 + 11$ Vertex (-3, 11) Opens up

(c) $y = -2(x - 6)^2 - 8$ Vertex (6, -8) Opens down

(d) $y = \frac{3}{4}(x + 13)^2 - 2$ Vertex (-13, -2) Opens up

(e) $y = -(x - 4)^2 + 5$ Vertex (4, 5) Opens down

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See Geogebra quadratic translation demo
(click here for link)

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Ex. 3. Identify the transformations (in the correct order), the vertex, axis of symmetry, and the direction of opening.

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

① ~~horizontal~~ shift right by 2

② ~~vertical~~ shift down by 3

Vertex $(2, -3)$

$x = 2$

opens up

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b) $y = 2(x + 4)^2$

① vertical stretch by 2

② shift left by 4 (−)

vertex $(-4, 0)$

$x = -4$

opens up

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c) $y = -0.5x^2 + 4$

$y = -0.5(x)^2 + 4$

$y = -0.5(x - 0)^2 + 4$

① vertical reflection

② vertical compression by 0.5

③ vertical shift up by 4 (+)

Vertex $(0, 4)$

$x = 0$ (y-axis)

opens down

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Assigned Work:

p. 262 # 1 - 5

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

4(a) $y = x^2 + 5$

v. shift up by 5

(f) $y = (x+6)^2 + 12$

h. shift left by 6

v. shift up by 12

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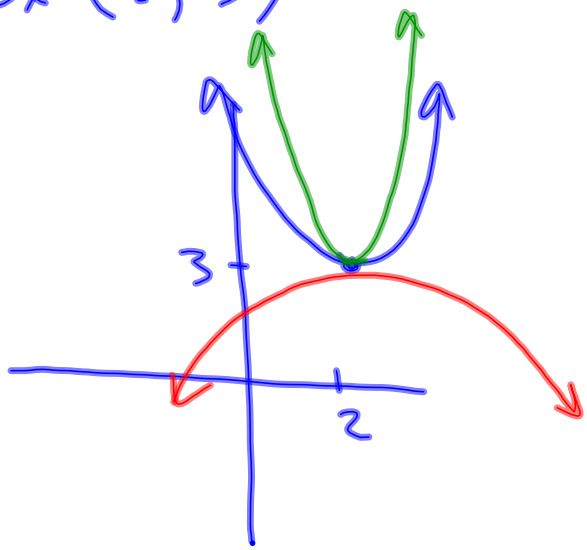
2. (a) $y = (x-2)^2 + 3$

Vertex $(2, 3)$

(iii)



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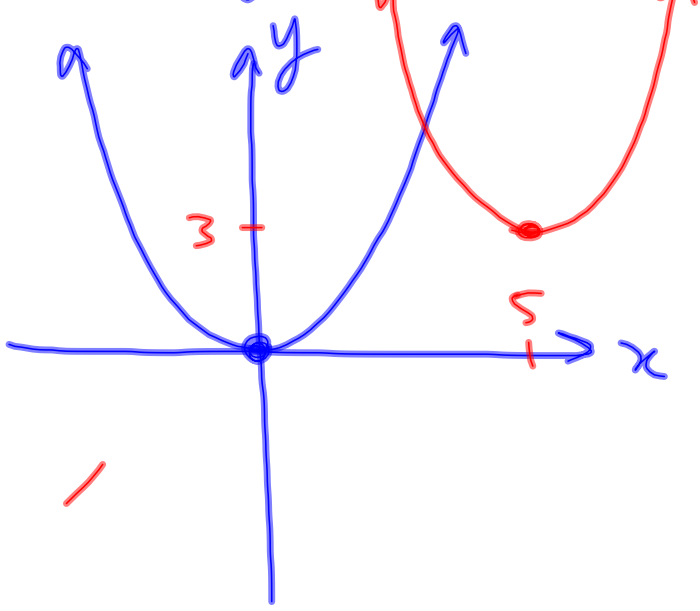
3(f) $y = (x-5)^2 + 3$



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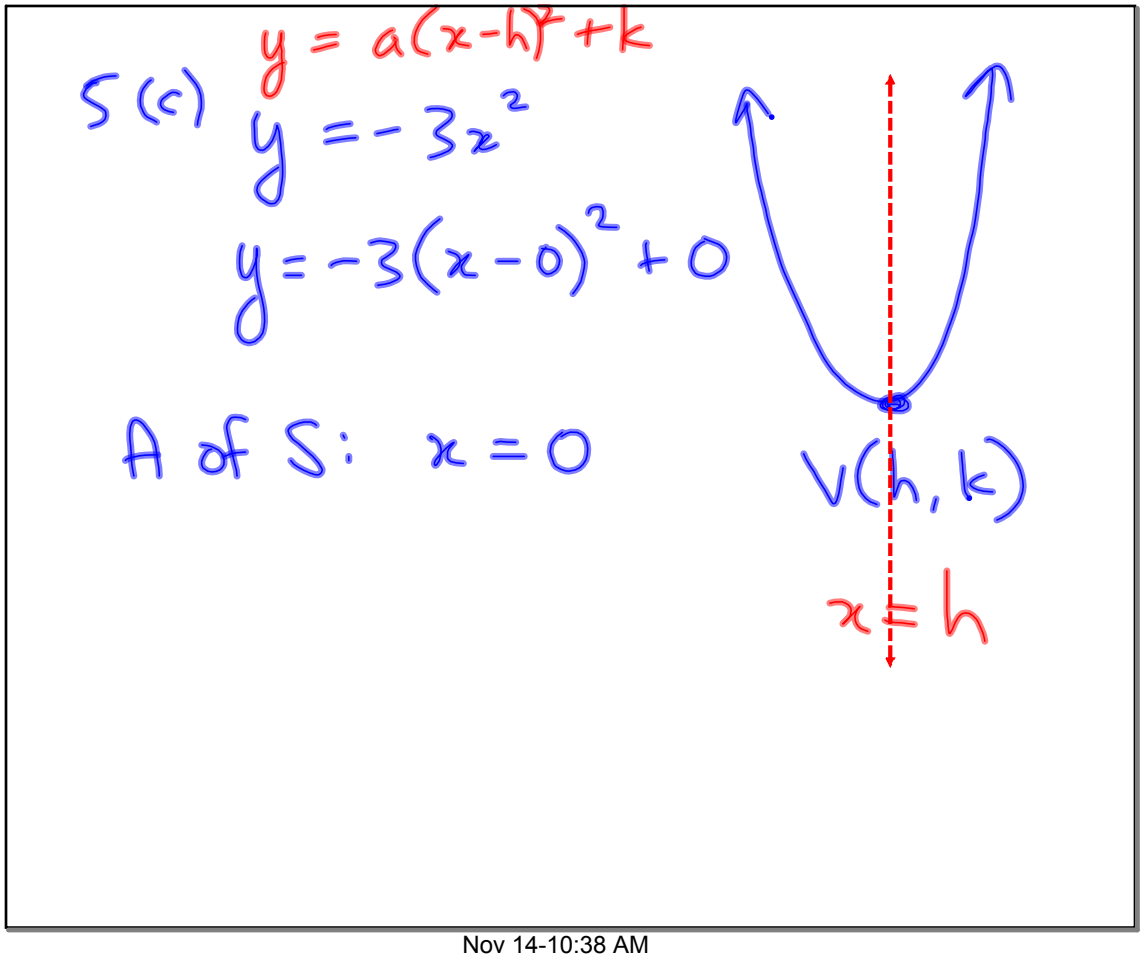

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