Objective: Write a quadratic function in vertex form from a graph

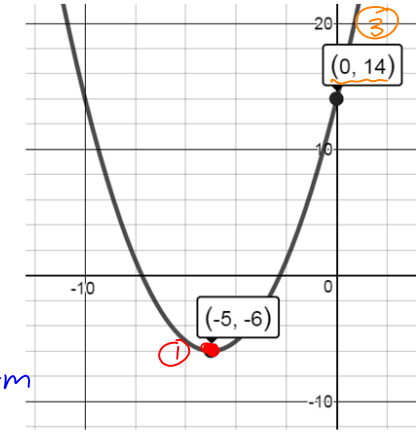
Concept

Steps to Write a Quadratic Function in Vertex Form

1. Identify the vertex, (h, k).
2. Substitute (h, k) into vertex form: $f(x) = a(x-h)^2 + k$
3. Identify another point on the function, (x, y).
4. Substitute (x, y) into vertex form and solve for a: $f(x) = a(x-h)^2 + k$
5. Write the final function with the values of a, h, and k.

Objective: Write a quadratic function in vertex form from a graph

Ex) Write the vertex form of the quadratic function represented by the graph.



vertex form

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

① find h and k

vertex $(-5, -6)$

(h, k)

② put h + k in vertex form

$f(x) = a(x-(-5))^2 + -6$

$f(x) = a(x+5)^2 - 6$

③ need another point on the parabola

point = $(0, 14)$

(x, y)

$f(x) = a(x+5)^2 - 6$

$14 = a(0+5)^2 - 6$

④ find a

$14 = 25a - 6$

$+6 \quad +6$

$\frac{20}{25} = \frac{25a}{25}$

$a = \frac{20}{25} = \frac{4}{5} = a$

reduce

⑤ finish vertex form

$f(x) = \frac{4}{5}(x+5)^2 - 6$

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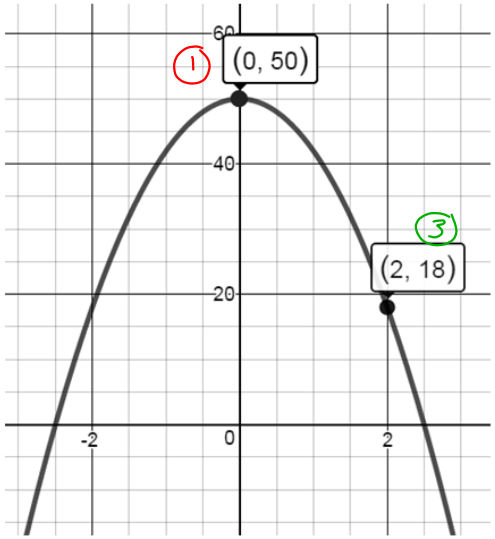
Ex) Write the vertex form of the quadratic function represented by the graph.

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



① vertex = $(0, 50)$ (h, k)

② $f(x) = a(x-0)^2 + 50$

$f(x) = ax^2 + 50$

③ need another point

point = $(2, 18)$ (x, y)

$f(x) = ax^2 + 50$

④ find a

$18 = a(2)^2 + 50$

$18 = 4a + 50$

$-50 \quad -50$

$\frac{-32}{4} = \frac{4a}{4}$

$a = -8$

⑤ finish vertex form

$f(x) = -8x^2 + 50$

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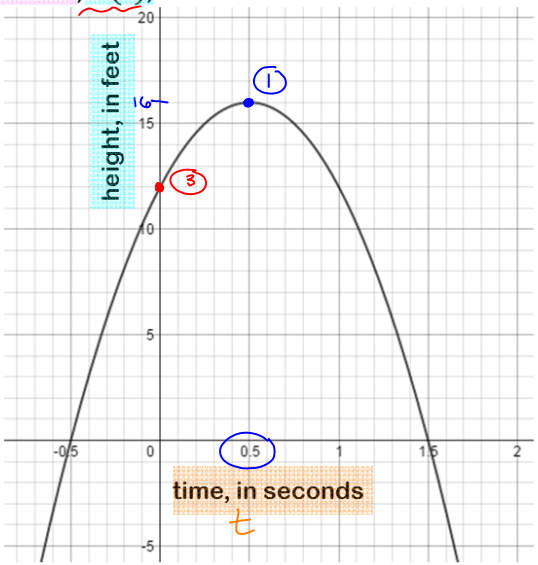
Ex) A tennis ball is tossed upward from a balcony. The height of the ball above the ground, in feet, at a time of t seconds can be modeled by the function shown in the graph. Find the vertex form of the function, $h(t)$, that could be used to model this situation.



vertex form

$h(t) = a(t-h)^2 + k$

① vertex $(0.5, 16)$

(h, k)

② $h(t) = a(t-0.5)^2 + 16$

③ another point

point = $(0, 12)$

$(t, h(t))$

$h(t) = a(t-0.5)^2 + 16$

$12 = a(0-0.5)^2 + 16$

$12 = a(-0.5)^2 + 16$

④ find a

$12 = 0.25a + 16$

$-16 \quad -16$

$\frac{-4}{0.25} = \frac{0.25a}{0.25}$

$a = -16$

⑤ finish vertex form

$h(t) = -16(t-0.5)^2 + 16$

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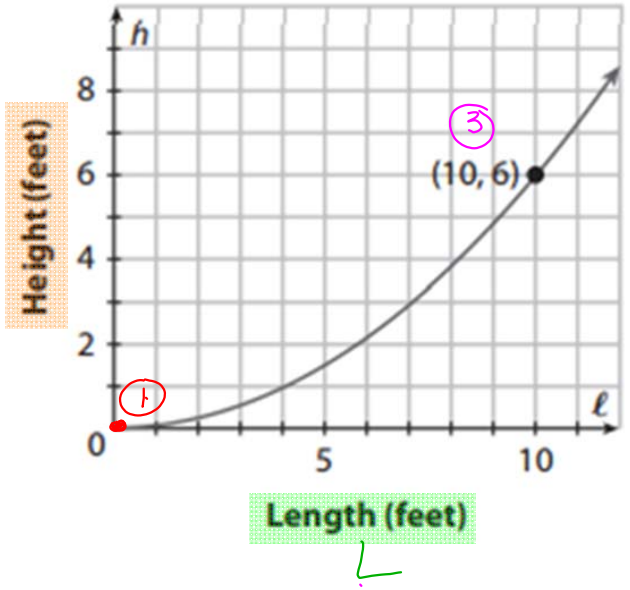
Ex) Adrian is building a homemade skate ramp and wants to model the shape as a parabola. He sketches out a cross section shown below. Write the vertex form of the function, $H(L)$, that models the curve of the ramp.



Vertex form

$H(L) = a(L-h)^2 + k$

① vertex = (0, 0) (h, k)

② $H(L) = a(L-0)^2 + 0$

$H(L) = aL^2$

③ another point

point = (10, 6) $(L, H(L))$

$H(L) = aL^2$

$6 = a(10)^2$

④ find a

$\frac{6}{100} = \frac{100a}{100}$

$a = 0.06$

⑤ finish Vertex Form

$H(L) = 0.06L^2$

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Closure

Matthew thinks he can use the points $(0,11)$ and $(4,3)$ to write the vertex form of the quadratic function. Do you agree or disagree with Matthew? Explain your reasoning.

I disagree with Matthew because neither of the points he wants to use are the vertex of the parabola, and the values of h and k in the vertex form $f(x) = a(x-h)^2 + k$ have to be the coordinates of the vertex.