Objective: Write a Quadratic Function in Vertex Form from a Table

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.

x	$f(x)$
-2	4
-1	1
0	0
1	1
2	4

Note: To identify the vertex of a quadratic function from a table look for symmetry in the y values.

← The vertex is $(0,0)$.

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Objective: Write a Quadratic Function in Vertex Form from a Table

Ex) Write a quadratic function in vertex form using the information in the table.

x	$f(x)$	
1	20	
2	26	
3	28	vertex
4	26	
5	20	

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

① vertex = $(3, 28)$ (h, k)

② $f(x) = a(x-3)^2 + 28$

③ another point

point = $(5, 20)$ $(x, f(x))$

$f(x) = a(x-3)^2 + 28$

$20 = a(5-3)^2 + 28$

④ find a

$20 = 4a + 28$

$-28 \quad -28$

$\frac{-8}{4} = \frac{4a}{4}$

$a = -2$

⑤ finish vertex form

$f(x) = -2(x-3)^2 + 28$

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Ex) Write a quadratic function in vertex form using the information in the table.

x	$g(x)$	
4	-45	
7	-20	
10	-5	
13	0	vertex
16	-5	

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

① vertex = $(13, 0)$ (h, k)

② $g(x) = a(x-13)^2 + 0$

$g(x) = a(x-13)^2$

③ another point

point = $(10, -5)$ $(x, g(x))$

$g(x) = a(x-13)^2$

④ find a

$-5 = a(10-13)^2$

$(-3)^2$

$-\frac{5}{9} = \frac{9a}{9}$

$a = -\frac{5}{9}$

⑤ finish vertex form

$$g(x) = -\frac{5}{9}(x-13)^2$$

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Closure

Mike was standing on a cliff when he tossed a rock into the air. He wanted to write a function, $h(t)$, that would model the height of the rock for any given time, t, in seconds. He knew the following:

- the height of the cliff was about 30 meters
- at 1 second the rock reached a height of about 45 meters
- at 2 seconds the rock reached its maximum height of 50 meters

Write a quadratic function in vertex form that models this situation.

$$vertex\ form: h(t) = a(t-h)^2 + k$$

1. $vertex = \text{maximum} = (2, 50)$

2. $h(t) = a(t-2)^2 + 50$

3. $\text{point} = (0, 30)\ or\ (1, 45)$

4. $30 = a(0-2)^2 + 50$

$30 = 4a + 50$

$-20 = 4a$

$a = -5$

5. $\boxed{h(t) = -5(t-2)^2 + 50}$