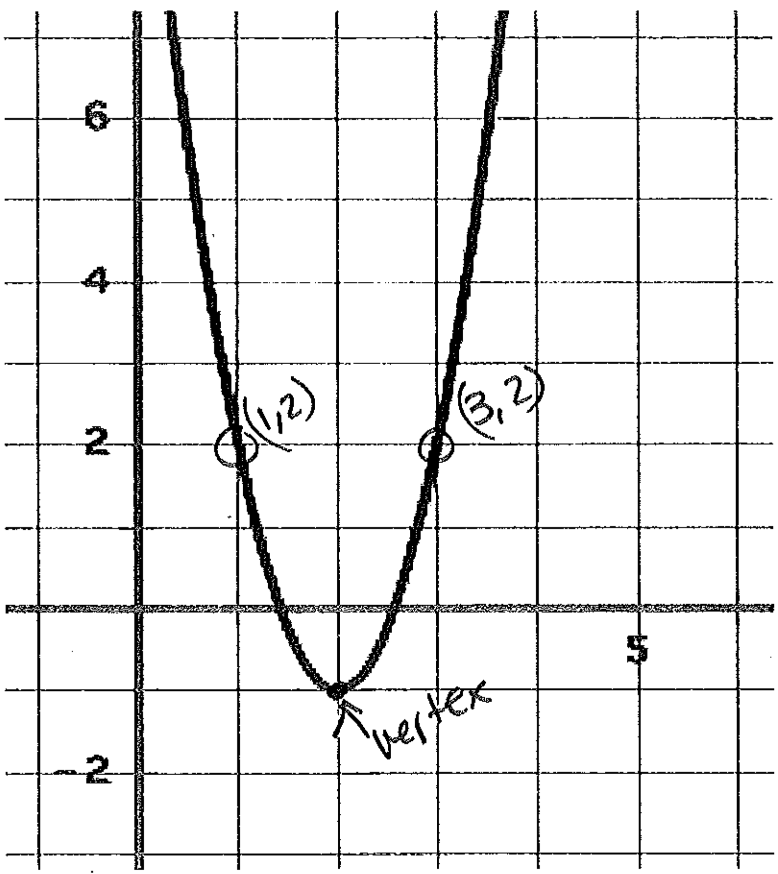
Adv Alg

# HOW TO FIND THE DILATION FACTOR OF A TRANSFORMED FUNCTION

$f(x) = a(x - h)^2 + k$ is the ***vertex form*** of a parabola. The vertex of the parabola is given by (h, k). The dilation factor is ***a***. This form allows us to graph transformations with ease compared to the standard form of a quadratic, which is $f(x) = ax^2 + bx + c$. The horizontal shift is represented by *h* and the vertical shift is represented by *k*.

If you are given a graph of a quadratic, using the vertex form, you can find the equation of the graph. You can find the dilation factor, *a*, by first noting the shifts and selecting a coordinate point of the graph.




Step 1: Identify the shifts: Compared to the parent function, how is the vertex moved? compared to the parent fxn

Horizontal shift or *h*: 2 right

Vertical shift or *k*: 1 down

Step 2: Substitute the shifts into the vertex form of the equation.

$g(x) = a(x \underline{-2})^2 \underline{-1}$

Step 3: Select a coordinate point from the graph.

( 1 , 2 )
x , y

Step 4: Substitute in the *x* and *y* values from step 3 into the vertex form from step 2 and solve for *a*.

remember g(x) is "y"

$2 = a(1-2)^2 - 1$

$2 = a(-1)^2 - 1$

$2 = a(1) - 1$

$2 = a - 1$

$+1 \quad +1$

$a = 3$

so, $\boxed{g(x) = 3(x-2)^2 - 1}$

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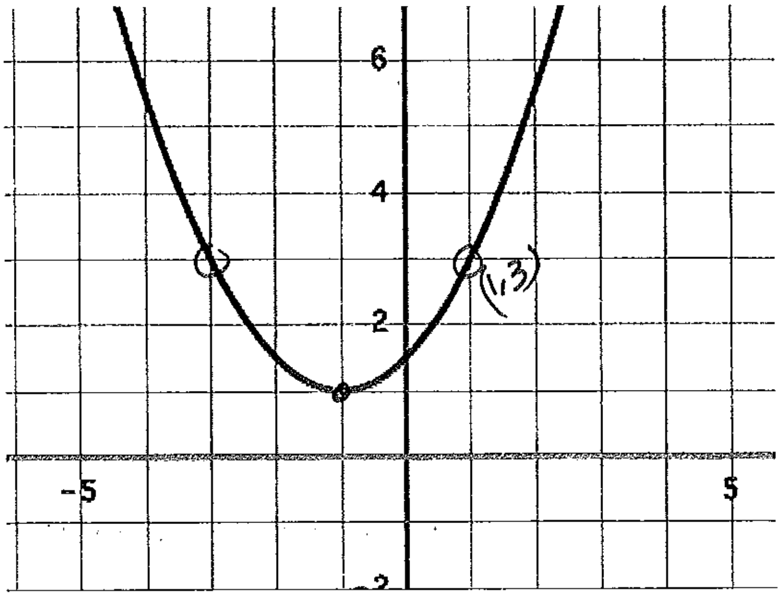
Now you try. Find the equation of the graph below.




Step 1: Identify the shifts. (of the vertex from the origin)

1 left

1 up

Step 2: Substitute in shifts into vertex form.

$$g(x) = a(x+1)^2 + 1$$

Step 3: Select a coordinate point of the graph.

$$(1,3) \rightarrow (x,y)$$

Step 4: Substitute in the coordinate point into the vertex form and solve for *a*.

$$3 = a(1+1)^2 + 1$$
$$3 = a(2)^2 + 1$$
$$3 = 4a + 1$$

$$3 = 4a + \cancel{1}$$
$$\underline{-1 \qquad -\cancel{1}}$$
$$\frac{2}{4} = \frac{4a}{\cancel{4}}$$

$$a = \frac{2}{4} = \frac{1}{2}$$

Step 5: Write the equation of the graph.

$$g(x) = \frac{1}{2}(x+1)^2 + 1$$