Identifying Vertical Stretch or Shrink

Give the base function, the transformations in proper order, and the equation for each of the following graphs.

a. base function: \( y = x^2 \)
   
   horizontal shift right 3 \( \rightarrow y = (x - 3)^2 \)
   
   For now, we will just say vertical stretch or shrink by a factor of “a” \( \rightarrow y = a(x - 3)^2 \)
   
   No x-axis or y-axis reflection
   
   vertical shift up 1 \( \rightarrow y = a(x - 3)^2 + 1 \)
   
   To find the specific value of a:
   
   Identify a point on the graph other than the vertex;
   
   plug the x and y-values of the point into the equation;
   
   solve for a.

   point: \((1, 2)\)
   
   \( 2 = a(1 - 3)^2 + 1 \)
   
   \( 1 = 4a \)
   
   \( a = \frac{1}{4} \)

   vertical shrink by a factor of \( \frac{1}{4} \)

   \[ y = \frac{1}{4}(x - 3)^2 + 1 \]

   To check your equation, graph it on a graphing calculator using the same window as the given graph and check to see if all the points are the same.

b. base function: \( y = |x| \)
   
   horizontal shift left 2 \( \rightarrow y = |x + 2| \)
   
   vertical stretch of shrink by a factor of a
   
   \( \rightarrow y = a|x + 2| \)
   
   x-axis reflection \( \rightarrow y = -a|x + 2| \)
   
   vertical shift down 4 \( \rightarrow y = -a|x + 2| - 4 \)
   
   point: \((-1, -7)\)
   
   \(-7 = -a|-1 + 2| - 4 \)
   
   \(-3 = -a \)
   
   \( a = 3 \)

   vertical stretch by a factor of 3

   \[ y = 3|x + 2| - 4 \]

   To check your equation, graph it on a graphing calculator using the same window as the given graph and check to see if all the points are the same.