SOLUTIONS

1. (a) The graph has undergone:

   - a horizontal translation of 5 units to the left
   - a vertical skewing (stretched by a factor of 2)

   (b) We can rewrite this function as

   $$f(x) = -|x - 3| + \frac{7}{2}.$$

   Now we can more easily see that the graph has undergone:

   - a horizontal translation 3 units to the right
   - a vertical reflection
   - a vertical translation $\frac{7}{2}$ units upwards

2. (a) This graph has undergone:

   - a vertical skewing (stretched by a factor of 3)
   - a vertical reflection
   - a vertical translation 2 units downwards

   (b) We can rewrite this function as

   $$y = [2(x + 1)]^2 = 2^2(x + 1)^2 = 4(x + 1)^2.$$

   Now we can see that this graph has undergone:

   - a horizontal translation 1 unit to the left
   - a vertical skewing (stretched by a factor of 4)

3. (a) This graph has undergone:

   - a horizontal translation 4 units to the right
   - a vertical translation 1 unit upwards

   (b) We can write this function as

 $$f(x) = -\frac{2}{5}\sqrt{-(x - 4)}.$$

   From this, we see that the graph has undergone:

   - a horizontal translation 4 units to the right
   - a horizontal reflection
   - a vertical skewing (shrunk by a factor of $\frac{2}{5}$)
   - a vertical reflection

4. (a) Since the vertex is the point $(0,1)$, the axis of symmetry is the line $x = 0$ (that is, the y-axis). See the graph, below.
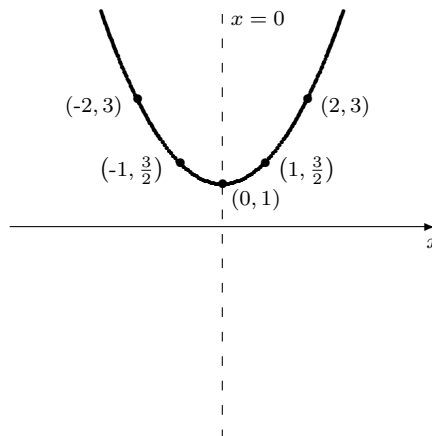
(b) Since the vertex is the point $(2,1)$, the axis of symmetry is the line $x = 2$. See the graph, below.
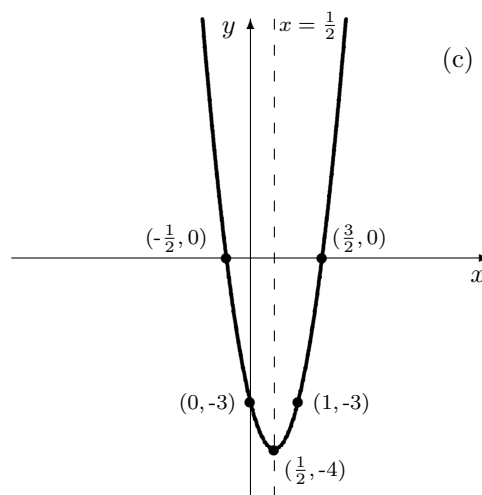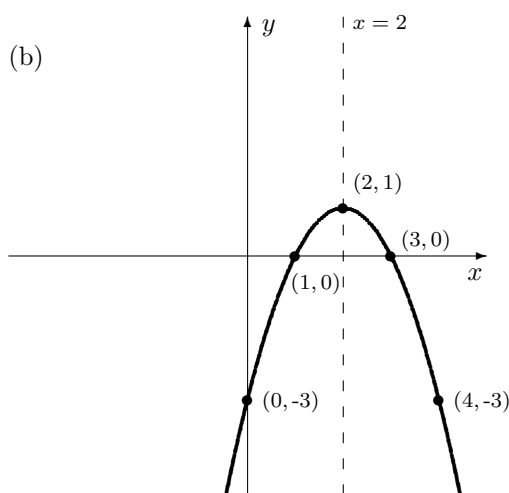
(c) Since the vertex is the point $\left(\frac{1}{2}, -4\right)$, the axis of symmetry is the line $x = \frac{1}{2}$. See the graph, above.