Transforming Quadratics

Sketch the transformation of $f(x) = x^2$, then rewrite each function in the form: $g(x) = a(b(x - h))^2 + k$

1. Reflect over the x-axis, vertically stretch by 4, shift right 3, shift down 5.

2. Horizontally compress by 2, reflect over the y-axis, shift left 4, shift up 6.

3. Reflect over both axes, horizontally stretch by 3, vertically compress by 1/2, shift up 2.

4. Vertically stretch by 5, shift right 1, shift down 7.

5. Horizontally stretch by 4, reflect over the x-axis, shift left 2.

Rewrite each function in the form, $g(x) = a(b(x - h))^2 + k$, describe all transformations of $f(x) = x^2$ in the correct order, then sketch the function.

6. $g(x) = -2(x - 3)^2 + 4$

7. $g(x) = -\frac{1}{2}(x + 8)^2 + 3$

8. $g(x) = -\frac{5}{2}(-3(x - 1))^2 + 2$

9. $g(x) = \frac{1}{3}(2x + 6)^2 - 5$

10. $g(x) = 6 - 3(2x - 4)^2$

11. $g(x) = 4 - (x + 2)^2$

12. $g(x) = -3(2x + 4)^2 + 1$

13. $g(x) = 5 - 4(x - 6)^2$

14. $g(x) = 2(9 - 3x)^2 - 7$

15. $g(x) = 7 - (4x - 12)^2$

16. A transformation of x^2 has vertex at $(4, -3)$.
    a. Use the image of (0,0) to determine h and k.
    b. The transformed graph also passes through $(6, 5)$. Use this point to determine the vertical scale factor.
    c. Write the equation in the form $g(x) = a(x - h)^2 + k$.

17. A transformation of x^2 has vertex at $(-2,6)$. The graph also contains the point $(0, -2)$.
    a. Determine h and k.
    b. Use the second point to determine a.
    c. Write the equation.

18. A transformation of x^2 sends the point $(0, 0)$ to $(3, -8)$, and sends the point $(1, 1)$ to $(5, -2)$.
    a. Explain why the first image determines the vertex.
    b. Use the image of (1,1) to determine the vertical scale factor.
    c. Write the transformation equation.

19. A transformed parabola has vertex at (h, k). The image of (1,1) is exactly 4 units above the vertex.
    a. Determine the value of a.
    b. Explain what this tells you about vertical stretch or compression.
    c. Write a possible equation.

20. A transformation of x^2: sends (0,0) → (2, –5) and sends (1,1) → (3, –1)
    a. Determine h and k.
    b. Use the second point to determine a.
    c. Write the transformation equation.
    d. Verify by substituting both original points.