Factored Form of Quadratic Functions

*Only use your calculator to check your answers.*

In an equation like $y = 2 \ (x + 3) \ (x - 4)$, one can quickly find the intercepts and the vertex.

1. What is the value of $x$ at the $y$-intercept? Substitute this value for $x$ in the equation, and find the $y$-intercept.

2. What is the value of $y$ at the $x$-intercepts? Substitute this value for $y$ in the equation, and find the $x$-intercepts with the help of the Zero Product Property.

3. If you know the $x$-intercepts, how can you find the $x$-coordinate of the vertex? Find it.

4. If you know the $x$-coordinate of the vertex, how can you find its $y$-coordinate? Find it.

5. Find the intercepts and vertex for:
   a. $y = .5 \ (x - .4) \ (x - 1)$
   b. $y = 2 \ (x + 3) \ (x + 4)$

6. Explain in words and symbols how you would find the intercepts and vertex for a function of the form:
   $$y = a \ (x - p) \ (x - q)$$

7. Find the equation and the vertex for a parabola with intercepts:
   a. (3, 0), (6, 0), (0, 36)
   b. (3, 0), (6, 0), (0, 9)
   c. (-3, 0), (-6, 0), (0, -9)
   d. (-3, 0), (6, 0), (0, 6)

8. The vertex and one of the two $x$-intercepts of parabolas are given. Find the equation and the $y$-intercept.
   a. vertex: (2, -2). $x$-intercept: (1, 0)
   b. vertex: (1, -12). $x$-intercept: (-1, 0)
   c. vertex: (3, 4.5). $x$-intercept: (6, 0)