3. [11 points] The graph below shows part of
   - a quadratic function $q(x)$ with vertex and one zero marked
   - an exponential function $r(x) = ab^x$ that intersects $q(x)$ on the $y$-axis.

   ![Graph of quadratic and exponential functions]

   a. [4 points] Find a formula for $q(x)$.

   b. [2 points] What is the $x$-coordinate of the other zero of $q(x)$?
   Recall that the formula for $r(x)$ is $r(x) = ab^x$. Use the graph and your formula for $q(x)$ to answer the following questions.

   c. [3 points] Which of the options below could be true? Briefly explain your answer.
      $$a < 0 \quad 0 < a < 1 \quad a > 1$$

   d. [2 points] Which of the options below could be true? Briefly explain your answer.
      $$b < 0 \quad 0 < b < 1 \quad b > 1$$

4. [9 points] An ice cream shop along the Huron river in Ann Arbor is only open in the summer. Its owner has designed a model that predicts the revenue (that is, the amount of money the shop takes in) of the shop in thousands of dollars, $P$, on a day where the maximum temperature is $T$ degrees Fahrenheit. The model is described by the function $P = g(T)$, and has an inverse, $g^{-1}(P)$.
   The maximum temperature in Ann Arbor, in degrees Fahrenheit, on the $d^{th}$ day that the shop is open for the summer, is given by the function $M(d)$.
   For each of the following, either give a practical interpretation of the given expression, or explain why the expression doesn’t make sense in the context of the problem.

   a. [3 points] $g(M(13)) = 8$

   b. [3 points] $g^{-1}(5)$

   c. [3 points] $M(g^{-1}(7))$