5. [12 points]
   a. [3 points] Find the local linearization $L(x)$ of the function
      \[ f(x) = (1 + x)^k \]
      near $x = 0$, where $k$ is a positive constant.

   b. [3 points] For which values of $k$ does this local linearization give underestimates of the actual value of $f(x)$? (Show your work.)

   c. [2 points] Suppose you want to use $L(x)$ to find an approximation of the number $\sqrt{1.1}$. What number should $k$ be, and what number should $x$ be?

   d. [2 points] Approximate $\sqrt{1.1}$ using $L(x)$.

   e. [2 points] What is the error in the approximation from part (d)?