

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)?