

Section 3.4: Local Linearity

Section Objectives:

- Find the equation of the tangent line to a function and use it to approximate the function.
- Interpret marginal cost, marginal revenue and marginal profit in terms of linear approximations.

Practice Problems

1. Let $f(x) = \sqrt{x}$.

(a) Find the equation of the tangent line at $x = 4$.

(b) Use the equation of the tangent line to approximate $\sqrt{4.1}$.

(c) Use a calculator to find the exact value of $\sqrt{4.1}$. Compare it to your estimate. Illustrate with a graph.

2. Find the equation of the tangent line to $f(x) = \ln(x)$ at $x = 1$. Use this to approximate $\ln(2)$ and $\ln(1/2)$. Compare to the actual values. Illustrate with a sketch of the graphs.

3. Derek is selling homemade cookies. His demand function is $p(x) = -1/4x^2 + 9$ where x is boxes of cookies sold and p is price per box of cookies, in dollars. Find and interpret $p(3)$ and $p'(3)$. Use these to approximate $p(4)$. How does this compare to the actual value?

4. Faith is selling computer monitors. She finds from her revenue function that $R(30) = 4000$ and that $R'(30) = 5$. Approximately how much more revenue will she get between selling the 30th monitor and the 31st monitor?

5. Bella makes and sells custom UConn hoodies. She has \$500 of startup costs, it costs \$10 of material to make each hoodie and she sells them for \$15.

(a) What are her cost, revenue and profit functions?

(b) Find and interpret $C'(30)$, $R'(30)$ and $P'(30)$, the marginal cost, marginal revenue and marginal profit?

(c) What do you notice about $C'(x)$, $R'(x)$ and $P'(x)$ for different x values? Why is this true?

More Practice from Textbook 4.4: You should do as many problems from each set (1-50, 51-62, 63-70, 71-76, 85-91), as needed until you are comfortable with these techniques. 63-70 are good practice for application problems.