Essentials of Calculus
Homework 3.4
The product and quotient rules

1. Find the derivative of each of the following functions.

   a) $f(x) = xe^x$

   b) $f(x) = x^2(x^2 + 1)^5$

   c) $f(x) = x^2 e^{x^2}$

   d) $f(x) = \frac{x^2}{x^2 + 2x + 1}$

   e) $f(x) = \frac{e^x}{e^x + 1}$

   f) $f(x) = (xe^x + 1)^3$

   g) $f(x) = x^2 \ln(x)$

   h) $f(x) = \frac{\ln(x)}{x}$

   i) $f(x) = \frac{2x^2 - 3x + 1}{x^2 + 3}$

   j) $f(x) = e^x \ln(x)$

2. Let $f(x) = \frac{4x - 1}{x + 1}$. Find the tangent line to the graph $y = f(x)$ at $x = 0$.

3. Let $f(x) = x \ln(x)$. Find the tangent line to the graph $y = f(x)$ at $x = 1$.

4. In order to sell q items, a company has to sell them at a price of $p = 100e^{-0.01q}$ dollars.

   a) What is the revenue function?

   b) What is the marginal revenue at $q = 10$ items?

5. In order to sell q items, a company has to sell them at a price of $p = 1000e^{-0.005q}$ dollars.

   a) What is the revenue function?

   b) What is the marginal revenue at $q = 25$ items?