Math Practice Problems

1. Find the derivative of the following functions:

   a. $y = 3x^9$

   b. $y = 5x^{-2}$

   c. $y = 5x + 5x^2$

2. If demand is given by

   $$P = 80 - Q,$$

   what is marginal revenue?

3. If a firm's profit function is

   $$\Pi = (80 - Q)Q - 10Q,$$

   what quantity will maximize the firm's profit?

4. Profit is

   $$\Pi = TR(Q) - TC(Q).$$

   What is $d\Pi/dQ$?

5. If the production function is of the Cobb-Douglas form, we write

   $$Q = AL^{\alpha}K^{1-\alpha}$$

   where A and α are constants.

   What are the marginal products of labor (L) and capital (K)?

6. If demand is $P = 50 - 2Q$ and total cost is $TC = Q^2 - 10Q + 5$, profit is

   $$\Pi = (50 - 2Q)Q - Q^2 + 10Q - 5$$

   a. What value of Q will maximize profit?

   b. What is the profit maximizing price?

   c. What is the maximum profit?

7.   If demand is $P = 100 - 0.10Q$, what value of Q will maximize total revenue? What will be the price and how much will total revenue be?

8.   Suppose that the demand for football tickets to the Michigan-Ohio State game is

$$P = 50 - 0.00025Q$$

   a.   What price will maximize total revenue?

   b.   How many tickets will be sold?

   c.   How much will total revenue be?

9.   Suppose that short-run profit is

$$\Pi = PQ(L) - wL.$$

and output as a function of labor is given by $Q(L) = 2L^2$

Find the optimal value for L.