The fun goes on and on . . .☺

Exercise 1

A producer of mining machinery operates according to the following supply and demand functions:

$$\text{demand: } P(Q) = 10 - Q \qquad \text{supply: } Q(P) = 2.5 + 0.5 \cdot P$$

a) Calculate the price and quantity sold in the market equilibrium!

b) Using the given demand function, compute the price that maximizes revenue! Also, compute this very maximum revenue!

c) Let's further suppose that our company operates according to the following cost function:

$$TC(Q) = 5 + 5 \cdot Q$$

What quantity Q should the company sell so as to maximize profit?

d) Try to find a mathematical relationship between total costs and price (not commonly found in textbooks, but absolutely possible)!

Exercise 2

Another company operates according to the following demand and supply functions:

$$\text{demand: } Q(P) = 3.5 - 0.5 \cdot P \qquad \text{supply: } P(Q) = (5 + 3 \cdot Q)^{0.5}$$

Again, calculate the price and quantity sold in the market equilibrium!

Exercise 3

According to an extensive employee satisfaction study conducted by the HR department of an international chemical corporation, employee satisfaction S is both positively and negatively influenced by the physical presence P of supervisors (P is always positive, of course). The underlying mathematical relationship is best described by:

$$S(P) = (3.2 \cdot P + 2 \cdot P^2) \cdot e^{-1.3 \cdot P}$$

a) What physical presence P would optimize employee satisfaction in this company?

b) Manager Bob believes that his physical presence measurably boosts employee satisfaction. In fact, since the aforementioned expression for $S(P)$ contains an exp-function, he is sure that the more present he is, the higher employee morale turns out to be. Do you agree? Try to either prove or disprove Bob's viewpoint!

Exercise 4
Manager Steve would love to know more about his company's specific price-demand relationship (for simplicity, we think of his company as selling only one product, sulphuric acid). The only thing he does know is that for a price of $10 per ton, his company was able to sell 1.2 mil. tons in 2002. In 2001, his company sold only 0.9 mil. tons for $11.50 per ton. Can you help Steve?

Exercise 5
Show for a <u>general</u> production function: For a maximum average product of labor, this very average product of labor is equal to the marginal product of labor.

Exercise 6
Rattletractor Inc. CFO Chuck Miser has discovered that his company's total cost function is best described by

$$TC(Q) = 2.5 + 2 \cdot (3Q^2 + 1)^{0.5}$$

a) Calculate Rattletractor's fixed costs!

b) For what input would marginal costs be equal to one?

c) Would you describe Rattletractor's costs as "increasing" or "decreasing" with Q ? Try to find some convincing arguments (you sure know what I mean . . .)!