Key Problems

Problem 1.
A company is renting out property, and has a cash flow which for the moment is 300 MNOK/year. We assume that the cash flow will increase in the coming years, and we use the function

$$f(t) = 300 \cdot e^{t/7}$$

to model cash flow (in MNOK/year) after t years. Compute the total income during the next ten years. How much of the total income will the compnay get in the first two years?

Problem 2.
A company is renting out property, and has a cash flow which for the moment is 300 MNOK/year. We assume that the cash flow will increase in the coming years, and we use the function

$$f(t) = 300 \cdot e^{t/7}$$

to model cash flow (in MNOK/year) after t years. Compute the present value of the cash flow during the next ten years. Use continuous compounding with discount rate $r = 10\%$.

Problem 3.
Assume that the (inverse) demand function $p = f(q)$ and the (inverse) supply function $p = g(q)$ is given by

$$f(q) = 200 - 2q \quad \text{and} \quad g(q) = q + 20$$

Find the equilibrium price, and compute the consumer surplus and the producer surplus. Show them as areas in a figure.

Problem 4.
Assume that the (inverse) demand function $p = f(q)$ and the (inverse) supply function $p = g(q)$ is given by

$$f(q) = \frac{6000}{q+50} \quad \text{and} \quad g(q) = q + 10$$

Find the equilibrium price, and compute the consumer surplus and the producer surplus. Show them as areas in a figure.

Problem 5.
Exam problem MET11803 06/2016
Compute the indefinite integrals:

a) $\displaystyle\int \frac{3x-4}{x^2+x}\,\mathrm{d}x$ b) $\displaystyle\int 18x^2 \ln(x+1)\,\mathrm{d}x$ c) $\displaystyle\int e^{\sqrt{x}}\,\mathrm{d}x$

Compute the improper integral. Explain that it can be interpreted as the area of a region R, and show R in a figure:

d) $\displaystyle\int_1^\infty \frac{1}{x^2+x}\,\mathrm{d}x$

Problem 6.

Exam problem MET11803 12/2015

A property is assumed to have value $V(t) = 120\, e^{\sqrt{t}/5}$ after t years. We use continuous compounding and discount rate $r = 4\%$ when we compute the present value of the selling price.

a. We wish to sell the property when the present value of the selling price is maximal. When is it optimal to sell the property?

b. Let T be the number of years it takes for the value of the property to double. Find T, and show that it takes another $3T$ years until the value is doubled again.

Problem 7.

Optional: Problems from [Eriksen] (norwegian textbook)

Problem 5.7.1 - 5.7.2 (textbook), 9.11 - 9.18 (workbook)

Answers to Key Problems

Problem 1.

Total income is $2100(e^{10/7} - 1) \approx 6\,663$ MNOK. Out of this amount, $2100(e^{2/7} - 1) \approx 694$ MNOK will come the first two years.

Problem 2.

The present value is $7000(e^{3/7} - 1) \approx 3\,745$ MNOK.

Problem 3.

The equilibrium price is $p^* = 80$, the consumer surplus is $3\,600$ and the producer surplus is $1\,800$.

Problem 4.

The equilibrium price is $p^* = 60$, the consumer surplus is $6000\ln(2) - 3000 \approx 1159$ and the producer surplus is $1\,250$.

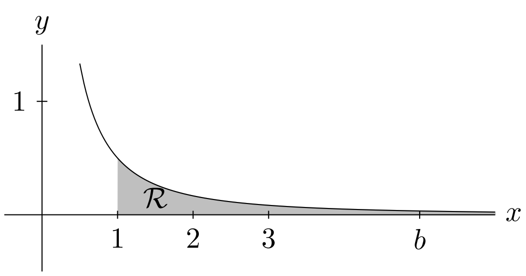
Problem 5.

a) $-4\ln|x| + 7\ln|x+1| + \mathcal{C}$

b) $6x^3\ln(x+1) - 2x^3 + 3x^2 - 6x + 6\ln(x+1) + \mathcal{C}$

c) $2(\sqrt{x} - 1)e^{\sqrt{x}} + \mathcal{C}$

d) The area of R is $A(R) = \ln(2) \approx 0.69$. A sketch of the region R is shown below.



Problem 6.

a) It is optimal to sell the property after 6.25 years

b) $T = (5\ln 2)^2 \approx 12$ years