



## Problem set for Seminar 5

See [www.kth.se/social/course/SF1625](http://www.kth.se/social/course/SF1625) for information about how the seminars work and what you are expected to do during the seminars. At this seminar you are to hand in a solution to a problem. Solve the problems 1-4 below and write down the solutions, one solution per sheet of paper. Write your name and personal number. When the seminar begins you will be told which problem to hand in. Before you start working on the problems below you should solve the recommended exercises from the text book:

Chapter 5.1: 1, 3, 7, 9, 17, 33. Chapter 5.2: 1, 3. Chapter 5.3: 1, 5, 9, 11, 17. Chapter 5.4: 1, 3, 23. Chapter 5.5: 3, 8, 27, 33, 39, 40, 41. Chapter 5.6: 5, 6, 7, 9, 21, 23, 43. Chapter 5.7: 11, 17.

---

### UPPGIFTER

**Uppgift 1.** Compute the integrals:

$$I_1 = \int_0^{\pi/4} \tan t \, dt$$

$$I_2 = \int_0^3 (|x - 1| - |x - 2|) \, dx$$

$$I_3 = \int_0^2 u \sin \frac{u^2}{2} \, du$$

**Uppgift 2.** Find the positive number  $x$  such that the integral  $\int_0^x (-t^2 + 4t + 5) \, dt$  is maximal. Also, find the maximal value of the integral. Is it possible to solve this problem in more than one way?

**Uppgift 3.** Approximate the integral  $\int_1^2 \frac{dt}{t}$  using a Riemann sum

- A. with two terms
- B. with four terms
- C. Explain why your answers to A and B can be used as approximations of  $\ln 2$ .

**Uppgift 4.** Let  $F(x) = \int_0^{\tan x} te^t dt$ . Compute  $F'(\pi/4)$ .

---

#### DISCUSSION PROBLEMS

Here are some extra problems to discuss at the seminar. You do not have to write down solutions in advance.

- In how many different ways can you compute the integral  $\int_0^1 x\sqrt{1-x} dx$  ?
- In how many different ways can you compute the integral  $\int_0^{1/2} \sin(x^2) dx$  ?  
In how many different ways can you approximate it?