Problem set for seminar 5

See www.kth.se/social/course/SF1625 for information about how the seminars work and what you are expected to do. **At this seminar there will be a hand-in.** Solve the problems 1-4 below and write down the solution with one problem per sheet of paper. Write name and birthdate on each sheet. When the serminar begins you will be told what problem to hand in. This will take place at the beginning of the seminar, so **don't be late!** Before you begin working on the problems below you should work on the recommended exercises in the text book Calculus by Adams and Essex (8:th edition):

Ch 5.1: uppg 1, 3, 7, 9, 17, 33. Ch 5.2: uppg 1, 3. Ch 5.3: uppg 1, 5, 9, 11, 17. Ch 5.4: uppg 1, 3, 23. Ch 5.5: uppg 3, 8, 27, 33, 39, 40, 41. Ch 5.6: uppg 5, 6, 7, 9, 21, 23, 43. Ch 5.7: uppg 11, 17. Ch 6.1: uppg 1, 3, 5, 7, 13, 21. Ch 6.2: uppg 1, 5, 9, 11, 13, 23.

PROBLEMS TO SOLVE BEFORE THE SEMINAR

Uppgift 1. Compute the integrals

A. $\int_0^1 \frac{1}{1+x^2}\,dx$

B. $\int_0^1 \frac{1}{4+x^2}\,dx$

C. $\int_0^1 \frac{x}{1+x^2}\,dx$

D. $\int_{-3}^{-2} \frac{1}{x+1}\,dx$

E. $\int_{-3}^3 |2x-1|\,dx$

F. $\int \frac{1}{x\ln x}\,dx$

Uppgift 2. Find $x > 0$ so that the integral $\int_0^x (-t^2+4t+5)\,dt$ attains maximum possible value. Also determine this value. Can you do this in more than one way?

Uppgift 3. Differentiate with respect to x.

A. $f(x) = \displaystyle\int_1^x \frac{\sin t}{t}\,dt$

B. $g(x) = \displaystyle\int_x^1 \frac{\sin t}{t}\,dt$

C. $h(x) = \displaystyle\int_1^{x^2} \frac{\sin t}{t}\,dt$

Uppgift 4. Approximate the integral $\int_1^3 \frac{dt}{t}$ by a Riemann sum

    A. with two terms

    B. with four terms

    C. Explain why your answers can be viewed as approximations of
       av $\ln 3$.

<div align="center">PROBLEMS TO DISCUSS AT THE SEMINAR</div>

ere are some extra problems. You don't have to write solutions in advance.

- Compute the integral $\int_0^1 x^2(1+x^3)^{-2/3}\,dx$

- Compute the integral $\int_0^{\pi/2} \frac{\cos x}{1+\sin x}\,dx$

- Compute the integral $\int_1^e x\ln x\,dx$

- Find all anti-derivatives to $f(x) = x^2\cos x$

- Find all anti-derivatives to $g(x) = \tan x$

- Compute the integral $\int_{-5}^{-4} \frac{1}{x^2+4x+3}\,dx$

- Compute the integral $\int_0^{2\pi} \sin^2 x\,dx$

- In how many inherently different ways can you compute $\int_0^1 x\sqrt{1-x}\,dx$?