

## 6. Home work Analysis II for MCS Summer Term 2006

### (H6.1)

- (i) Compute the following integrals using the Fundamental Theorem of Differential and Integral Calculus:

(a)  $\int_1^e \frac{1}{x} dx.$

(b)  $\int_0^\pi (x^n + \cos x) dx.$

(c)  $\int_0^{\frac{\pi}{4}} \frac{1}{1+x^2} dx.$

- (ii) Prove that

$$1 \leq \int_0^1 \exp(x^2) dx \leq e.$$

### (H6.2)

Let  $f : [0, 1] \rightarrow [0, \infty[$  be a continuous function and assume that  $\int_0^1 f(x) dx = 0$ . Show that  $f(x) = 0$  for all  $x \in [0, 1]$ .

### (H6.3)

Let  $f : [a, b] \rightarrow \mathbb{R}$  be such that  $f$  is of class  $C^2$  and  $f(a) = f(b)$ . Prove that

$$\int_a^b x f''(x) dx = b f'(b) - a f'(a).$$

Hint: Find an antiderivative of  $x f''(x)$  and apply the Fundamental Theorem of Differential and Integral Calculus.

# Orientation Colloquium

The Department of Mathematics' Research Groups present themselves.

**Monday, 29.05.2006 – 16:15-17:15 – S207/109**

Prof. Dr. Burkhard Kümmerer

FG Algebra, Geometrie und Funktionalanalysis

*“Im Dreiländereck Funktionalanalysis – Stochastik – Mathematische Physik“*

**After the talk there will be a relaxed get-together (coffee, tea and biscuits) in S215/219, where interested people can discuss the talk and become more acquainted with the lecturer.**