Mathematical analysis II — Tutorial 2

`http://kam.mff.cuni.cz/~tereza/teaching.html`

Problem 1: Find primitive functions (on maximal intervals):

a) $\int \left(x^4 + \frac{2}{x^2} + \frac{16}{x}\right)\,dx$

b) $\int (3e^x + \cos x)\,dx$

c) $\int \left(\frac{1}{\cos^2 x} + \sqrt[3]{x}\right)\,dx$

d) $\int \left(\frac{(1-x)^2}{x\sqrt{x}}\right)\,dx$

e) $\int |x|\,dx$

f) $\int |\sin x|\,dx$

Problem 2: Find primitive functions (on maximal intervals) by integration by parts:

a) $\int x^3 \ln x\,dx$ b) $\int xe^x\,dx$ c) $\int (x^3 + 3x - 2)\cos x\,dx$ d) $\int \cos^2 x\,dx$

Problem 3: Express primitive functions by recurrent formulae. Specify on which intervals your results hold.

a) $\int e^x x^n\,dx$

b) $\int \frac{1}{(1+x^2)^n}\,dx$

Problem 4: Find primitive functions (on maximal intervals) using substitutions:

a) $\int \sqrt[3]{1-3x}\,dx$

b) $\int \frac{x}{(1+x^2)^2}\,dx$

c) $\int xe^{-x^2}\,dx$

d) $\int \frac{x^2}{(1-x)^{100}}\,dx$

e) $\int \frac{1}{1-\sqrt{x}}\,dx$

f) $\int 2^x\,dx$

g) $\int \frac{1}{x \ln x}\,dx$

h) $\int \frac{x}{1+x^4}\,dx$

i) $\int \frac{x}{\sqrt{4-x^4}}\,dx$

j) $\int \sin^7 x \cos x\,dx$

k) $\int \operatorname{cotg} x\,dx$

l) $\int \arctan x\,dx$

Mathematical analysis II — Homework 2

Due: 9:00, 6.3.2019

Write your solution of each problem on a separate sheet of paper of format A4, without torn edges. One part will be marked for credit.

Problem 1: Find primitive function on maximal intervals: $\int |\sin x + \cos x|\,dx$

Problem 2: Using integration by parts, express $\int \sin^n x\,dx$ by a recursive formula.

Problem 3: Show that $\int \ln(\ln x)\,dx$ cannot be expressed using elementary functions.