Mathematical analysis II — Tutorial 6

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

Problem 1: Determine the area of the regions enclosed by curves:

a) $y = 2x^2 + 10; y = 4x + 16$,

b) $y = \sin x; y = \cos x; x = 0; x = \pi/2$,

c) $y = x - 1; x = y^2/2 - 3$.

Problem 2: Determine the area of the elipse with semi-axes a a b.

Problem 3: Determine the length of the curve $y = \ln(1/\cos x)$ for $x \in [0, \pi/4]$.

Problem 4: Find the volume of the solid of revolution generated by rotating

a) part of parabola $y = x^2 - 4x + 5$ for $x \in [1, 4]$ around x-axis (i.e., around axis $y = 0$),

b) area between the curves $y = x - 1$ and $y = \sqrt{x - 1}$ around axis $x = -1$,

c) area below the graph of $1/x$ for $x \in [1, \infty)$ around x-axis.

Problem 5: Using integral criterion, decide wheter the series $\sum_{n=5}^{\infty} \frac{1}{n \ln n \ln \ln n}$ converges or diverges.

Mathematical analysis II — Homework 6

Due: 9:00, 3.4.2019

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: Prove the following inequality $0 \leq \int_1^2 \frac{1}{x^2 + e^x}\, dx \leq 1$.

Problem 2: Find the volume of the solid of revolution generated by rotating the area between curves $y = x^2 - 2x$ and $y = x$ around the axis $y = 4$.

Problem 3: Calculate the Riemann lower and upper sums for the function$f(x) = e^x$ on the interval $[a, b]$ where $a < b$, for a partition into n equal pieces of equal width h. Calculating each of these as the sum of a geometric series, and using the fact that $\lim_{h \to 0} \frac{e^h - 1}{h} = 1$, deduce that $\int_a^b e^x\, dx = e^b - e^a$.