Mathematical analysis 2, WNE, 2018/2019
meeting 1.

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General info

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Rules:

- The final grade is calculated on the basis of total points. You can earn 40 points during the final exam, also 20 points from each of two colloquia, and finally you can earn 20 in class.
- A student can take the exam if she/he participates in the class (you can be absent up to 3 times) and achieve at least 25/60 in the classes and from colloquia.
- There is a possibility to erase your class absences by doing some additional work. Let me know when you need to use this option.
- Out of 20 point which you can earn in class, 5 you can get for homework, 10 for short tests which are going to take place once every 2.5 weeks and 5 for activity in the class.

Problems

1. Let:
$$f(x) = \begin{cases} -x & x \in [0,1) \\ -1 & x \in [1,2) \\ x-3 & x \in [2,4] \end{cases}.$$
Check whether this function has an antiderivative. I so, find an antiderivative F, such that $F(1) = -1/2$.
2. Calculate:
   a) $\int \frac{x^4 - 2x^3 + 4x^2 + x - 3}{x^2}\,dx$,
   b) $\int \frac{\sqrt{x} - x^3 e^x + x^2}{x^3}\,dx$.
3. Calculate $\int \sin x \cos x\,dx$ using the following hints:
   a) by parts for $f(x) = \sin x, g(x) = \cos x$,
   b) by parts for $f(x) = \cos x, g(x) = \sin x$,
   c) by change of variable $y = \sin x$,
   d) by change of variable $y = \cos x$,
   e) using the double angle formula $\sin x \cos x = \frac{1}{2}\sin(2x)$.
4. Calculate by parts:
   a) $\int \ln|x|\,dx$,
   b) $\int x \cos x\,dx$,
   c) $\int x^2 e^{-x}\,dx$.
5. Calculate changing the variable:
   a) $\int x\sqrt{1+x^2}\,dx$,
   b) $\int x \cos x^2\,dx$.
6. Calculate:
   a) $\int \arcsin x\,dx$,
   b) $\int \cos^3 x\sqrt{\sin x}\,dx$,
   c) $\int e^x \sin x\,dx$,
   d) $\int \ln^2 x\,dx$,
   e) $\int x\sqrt{1-x^2}\,dx$.