

Mathematical Analysis 1, academic year 2019-2020, 1st term

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Tutoring activity diary

The numbers below refer to exercises collected in the booklet *Excercises in Mathematical Analysis I* from the homepage of Fabio Ciolli <http://www.mat.uniroma2.it/%7Eciolli/ExAn1.pdf>. The small letters refer to the exercises found at the webpage <http://calvino.polito.it/~terzafac/Corsi/analisi1/pdf/successioni-svolti.pdf>.

(1) 09–26–2019

A rather quick review on the most elementary functions and their graphs as a means to solve inequalities graphically, induction process:

- Polynomial inequalities: 1
- Rational inequalities: 3
- Irrational inequalities: 7
- Absolute value inequalities: 22
- Exponential and logarithmic inequalities: 26
- Trigonometric inequalities: 34
- Induction process: $(n! > 2^n, \forall n \geq 4) - (5^n - 1 \text{ is divisible by } 4, \forall n \geq 1)$

(2) 03–10–2018

Supremum, infimum, maximum and minimum of subsets of the real line:

- 42 – 43 – 45 – 49 – 54 – 57 – 60

(3) 10–10–2019

- Boundedness of numerical sets: 50 – 51 – 65 – 66
- Convergence of sequences: a) – b) – c) – g) – h) – 297 – 298 – 301

(4) 24–10–2019

- Limits of functions: 202 – 203 – 204 – 207 – 208 – 210 – 211 – 213 – 214 – 215 – 233

(5) 31 – 10 – 2019

Types of singularities (essential, removable and jumps); vertical and horizontal symptotes:

- Recap and basic examples
- 69 – 70 – 72 – 73 – 80 – 83

(6) 07–11–2019

Domain of a function and its asymptotes; sequences defined recurrently:

- Domain of a function and its asymptotes: 71 – 72 – 74 – 87
- Discuss the convergence of the sequences: $(u_{n+1} = \sqrt{u_n}, u_0 \in [0, \infty)) - (x_{n+1} = (x_n + 1)/(x_n + 2), x_0 = 0)$

(7) 14–11–2019

Computation of derivatives:

- Derivative: $(\ln |\ln(\sin(x))|) - (x^x) - (\log_x(2x)) - (\sin(x^{2e-x})) - ((x + \arctan x)^x) - ((1/x)^{\sin x})$
- k -th derivative, $k \in \mathbb{N}$: $(xe^x) - \text{Leibniz rule} - (x^p e^x, p \in \mathbb{N})$

(8) 21–11–2019

Study of the graph of a function:

- Exercise 1 from the written test of the 31st of January 2018 (without convexity/concavity)

(9) 28–11–2019

- Exercise 1 from the written test of the 26th of February 2019 (without convexity/concavity)

(10) 05–12–2019

- Exercise 2 and 5 from the written test of the 26th of February 2019
- Exercise 2 from the written test of the 31st of January 2019
- Exercise 2 from the written test of the 24th of July 2019

(11) 12–12–2019

- Recap on complex numbers
- Exercise 5 from the written test of the 31st of January 2019
- Exercise 5 from the written test of the 3rd of May 2019
- Exercise 5 from the written test of the 9th of July 2018

(12) 09–01–2020

- Computation of integrals: $(\int_1^2 e^x(1 + e^{2x})) - (\int (x^3 - 1)^{-1}) - (\int (1 + x^4)^{-1}) - (\int \sin(x)^{-1}) - (\int \log(2x^2 + 5x + 1))$