

Computer Science BSc; Analysis-1
Theorems to be proved in the Advanced Level Part of the Theoretical Exam (33 theorems)
2019/2020 Spring

1. Triangle Inequalities in \mathbb{R} **17 2.1**
2. Theorem about the connection between the convergent and the bounded sequences **3.4 3.21**
3. Five theorems (Th1-Th5) in connection with zero sequences **35 3.24 - 3.28**
4. The Sandwich Theorem **41 4.14**
5. Theorem about the convergence of geometric sequences **42 4.16**
6. Theorem about the convergence of $\sqrt[n]{a}$ and of $\sqrt[n]{n}$ **42 4.17 42 4.18**
7. Theorem about the convergence of $n^k \cdot q^n$ and of $\frac{n^k}{a^n}$ **43 4.20 43 4.21**
8. Theorem about the convergence of $\frac{x^n}{n!}$ **44 4.22**
9. Theorem about the convergence of a monotonically increasing sequence **49 5.4**
10. Theorem about the convergence of a monotonically decreasing sequence **49 5.4**
11. The sequence $\left(\left(1 + \frac{1}{n} \right)^n \right)$ is convergent **50 5.7**
12. Theorem about the connection between the addition and the infinite limit **54 5.21**
13. The theorem about the convergence and the sum of the geometric series **62 6.6**
14. The Zero-sequence Test **63 6.9**
15. The theorem about the Comparison Tests (Major Test, Minor Test) **65 6.17**
16. The Root Test (+ some examples for the indeterminate case) **74 7.9**
17. Theorem about the convergence set of a power series (using Root Test) **75 7.10(1)**
18. The function \exp is well-defined for any $x \in \mathbb{K}$ **94 9.1 (a)**
19. The connection between \exp , \cosh , \sinh and its important consequences **96 9.5; 96 9.6**
20. The connection between \exp , \cos , \sin (Euler's Identity) and its important consequences **96 9.5
96 9.6**
21. Addition Theorem of the exponential function **97 9.7**

22. The basic limits $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$, $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$ **124 13.4**
23. Theorem about the connection between the compact sets and the closed and bounded sets **7 1.15**
24. Theorem about the minimal and maximal elements of a compact set **7 1.17**
25. Theorem about the compactness of the image **9 2.1**
26. The minimax theorem of Weierstrass **9 2.3**
27. The Intermediate Value Theorem (Bolzano's Theorem) **11 2.8**
28. The theorem about the connection between the differentiability and the continuity **17 3.4**
29. The derivatives of the following functions: c , $ax + b$, x^n , e^x , $\sin x$ **17 3.2**
30. The derivative of the sum **18 3.5**
31. The derivative of the product **18 3.6**
32. The derivative of the quotient **19 3.7**
33. The derivatives of $\ln x$, $\arcsin x$ and $\arctan x$. **20 3.4(2) 26 4.11 26 4.13**