

# Math 301, Spring 2025 — Homework 5

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Due March 14 at 5:00 pm

**Instructions.** This problem set contains problems mostly from Week 5 of class. The problem numbers refer to our textbook, *Understanding Analysis* by Stephen Abbott.

**Problem 1.** Please do the following textbook problems: Exercises 2.6.2, 2.6.3, 2.7.1c, 2.7.4c, 2.7.7, 2.7.8ab

*Remark 1.* In Exercise 2.7.7, it will be helpful to use the less restrictive version of the Comparison Test that we mentioned during the lecture (ie. where we assume there exists  $N \in \mathbb{N}$  such that  $0 \leq a_n \leq b_n$  for all  $n \geq N$ ). Moreover, you may use without proof the fact that for any  $c \in \mathbb{R}$ , the series  $\sum b_n$  and  $\sum cb_n$  either both diverge or both converge.

*Remark 2.* In Exercise 2.7.8ab, you will probably find it helpful to refer to Problem 2 below.

**Problem 2.** Use the Cauchy criterion for series to prove that if the series  $\sum_{n=1}^{\infty} |a_n|$  converges and the sequence  $(b_n)$  is bounded, then the series  $\sum_{n=1}^{\infty} a_n b_n$  converges.