

Duke Math 431  
Spring 2015

## Homework 11

Due Friday, April 17

**Reading.** Sections 6.2.

**Problems.**

Section 5.7: #1, 2, 3(a,c,d,e), 5(a,c)

*Remark: For #2, note that the metric space may not be complete.*

*Remark: For #3 and #5 you must give proofs.*

Section 6.1: #1(a-c), 2, 6, 7, 9

*Remark: For #6, assume  $\{a_n\}$  and  $\{b_n\}$  are bounded.*

*Remark: For #9, prove only  $\limsup a_n = \sup P$  (and not also  $\liminf a_n = \inf P$ ).*

**Reflection.** Please put on a separate piece of paper.

Write ten or more sentences on the following topic. Recently we have seen multiple generalizations of earlier concepts in the class, or analogies back to earlier concepts in the class.

- Metric spaces generalize our notion of distance on  $\mathbb{R}$  or our (various) notions of distance on function spaces.
- We have seen Cauchy sequences of real numbers, Cauchy sequences of functions in the sup (or  $L^1$ ) norm, and Cauchy sequences in an arbitrary metric space.
- Proposition 5.3.1 for the sup norm is analogous to Proposition 1.1.2 for the absolute value, and is also analogous to 5.3 #4 about the  $L^1$  norm.
- Many problems on Homework 10 were analogous to results from earlier chapters.

You have undoubtedly seen other connections. Pick any such connection (perhaps different from the ones above) and write about it. Can you use this connection between two (or more) mathematical objects to strengthen your understanding of each individual object?