Math 447 - Spring 2025 - Homework 03

Revised: Monday, February 3, 2025

Status - Reading Assignments:

Here are the reading assignments to be completed before the first one of this HW.

WMS (Wackerly, et al. Textbook):

Nothing assigned yet

MF447 lecture notes:

ch.1 - 3, ch.4.1, parts of ch.5.1

Other:

Nothing assigned yet

New reading assignments:

It is really important for the WMS reading assignments that you work through the examples!

Reading assignment 1 - due: Wednesday, February 5:

- **a.** Catch up with the material already covered in lecture: • Carefully read MF ch.4.2 until before Theorem 4.6 (Fubini's theorem for Lebesgue integrals) in ch.4.2 • Carefully read MF ch.5.1 through Proposition 5.2. and from Theorem 5.3 until before Theorem 5.5 (WMS Ch.02.8, Theorem 2.6). All this is about σ–algebras and Borel sets.
- **b.** Carefully read the remainder of MF ch.4. (Very little is left)
- **c.** Carefully read the parts of MF ch.5.1 not covered in **(a)**. Very little is left here, too, but the all important (final) definition of a probability space is part of it.

Reading assignment 2 - due Friday, February 7:

- **a.** Carefully read MF ch.5.2 and ch.5.3. Try to visualize Corollary 5.4.

General note on written assignments: I will not collect those assignments for grading but doing them might be helpful for your quizzes and exams.

Written assignments are on the next page.

(a) Work closed book through the examples given in Section 3.4 (Series and Integrals as Tools to Compute Probabilities).

All integrals in there are given as Riemann integrals.

(b) Write rom memory the following definitions and compare them with the MF lecture notes:

- Step functions and simple functions
- Lebesgue integral for $f \geq 0$. For the strong students: Can you draw a picture that shows how such f is approximated from below by simple functions?
- Properties of the Riemann integral.
- Properties of the Lebesgue integral.
- Monotone and dominated convergence theorems. Write them from memory until you get the assumptions and conclusions right for both of them!
- Really important: Work through the examples given in Problem 4.1.
- Write Fubini's theorems from memory for both Riemann integral and Lebesgue integral.
- σ–algebras
- probability measures and probability spaces (ch.5 definition!) • equiprobability • Continuity property of probability measures (optional, but helpful)
- discrete probability spaces • Theorem 5.2 and Cor.5.1
- Read again Remark 5.7. In part **(d')**, understand the cases $n = 2$ and $n = 3$.
- Review the (otional) Fact 5.1. You will not be quizzed on it, but you want to understand it.
- Additive law of probability and the rule of the Complement
- Work Remark 5.11 closed book!
- Conditional probability • Multiplicative Law of Probability • Independence of $2, 3, n$ events and of sequences of events

Selected answers:

None, since all answers to **(a)** can be found in the lecture notes.