Math 447 - Fall 2025 - Homework 01

Republished: Sunday, August 17, 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:

Nothing assigned yet

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, August 20 (FIRST DAY OF LECTURE):

- **a.** Review my entire course site. You will find the syllabus (only!) on BrightSpace, but you should get used to go to THIS LINK instead. Only there you can find, e.g., the homework assignments. I will discuss only some parts of that website on the first day of lecture!
- **b.** Review MFCh.1.1 so you understand the format of my lecture notes, including what material is optional and thus will not be part of any graded assignment.
- **c.** Carefully read MF ch.1.2 through Example 1.2. The entire chapter 1 is denoted "preliminary", but if you do not study it, you will have issues to understand the more formal presentation of probability concepts which begin in chapter 3.

Reading assignment 2 - due Friday, August 22:

- **a.** Carefully read the remainder of MF ch.1.
- **b.** Review MF ch.2.1 – 2.3. Most of the content will be familiar to you from your calculus sequence, but quite a bit of the notation may be unfamiliar to you. For example, I write $[8, 28]_{\mathbb{Z}}$ to denote the set $\{8, 9, 10, \ldots, 27, 28\}$.

Written assignments are on the next page.

Written assignments - Not collected for grading:

Remember that **some of those assignments will be relevant for the quizzes and exams.**

(a) Use MF Example 1.2 as a template to figure out what happens when you consider the roll of two dice. Then compare what you have with MF Example 1.3.

(b) MF ch.2.1 (sets): Draw Venn diagrams for the formulas of Remarks 2.3 and 2.4 and Example 1.2.

(c) MF ch.2.1: Is any of the following a partition of $[0, \infty[$?
- **(c.1)** $\mathscr{A} := \{]k, k+2[: k = 0, 2, 4, \dots\}$
- **(c.2)** $\mathscr{B} := \{]k, k+2] : k = 0, 2, 4, \dots\}$
- **(c.3)** $\mathscr{C} := \{[k, k+2[: k = 0, 2, 4, \dots\}$
- **(c.4)** $\mathscr{D} := \{[k, k+2] : k = 0, 2, 4, \dots\}$

(d) MF ch.2.2: True or false?
- $\forall\, y \in \mathbb{Z}\ \ y + 5 \in \mathbb{Q}$ ___
- $\forall\, y \in \mathbb{Q}\ \ y + 5 \in \mathbb{Z}$ ___
- $\exists\, y \in \mathbb{Z}$ s.t. $y + 5 \in \mathbb{Q}$ ___
- $\exists\, y \in \mathbb{Q}$ s.t. $y + 5 \in \mathbb{Z}$ ___
- $\exists!\, y \in \mathbb{Z}$ s.t. $y + 5 \in \mathbb{Q}$ ___
- $\exists!\, y \in \mathbb{Q}$ s.t. $y + 5 \in \mathbb{Z}$ ___
- x is a rose $\Rightarrow$ x is a flower ___
- x is a flower $\Rightarrow$ x is a rose ___
- x is a flower $\Leftrightarrow$ x is a rose ___
- $x + y = 12 \ \Rightarrow\ x + y = 6 + 6$ ___
- $x + y = 6 + 6 \ \Rightarrow\ x + y = 12$ ___
- $x + y = 6 + 6 \ \Leftrightarrow\ x + y = 12$ ___

(e) Check those numbers that are elements of $\mathbb{Q}$.
$-\frac{13}{8}$ ___ $\frac{24}{8}$ ___ 0.3 ___ 3.0 ___ -13 ___ $16.6\bar{6}$ ___ $16.66\bar{6}6$ ___
$-\sqrt{2}$ ___ all $x \in \mathbb{N}$ ___ all $x \in \mathbb{R}$ ___ all $x \in \mathbb{Z}$ ___

(f) Added on Thu, Jan 23, 2025:
Work closed book through all the examples for preimages in the new MF doc section 2.5 (Preimages). You can ignore the examples given for direct images.
Understand and be able to reproduce Theorem 2.2 (f^{-1} is compatible with all basic set ops). In particular, understand that the preimages of a disjoint collection of sets are again disjoint and that the preimages of a partition form again a partition.

Selected answers:

(c) Only $\mathscr{C}$ is a partition of $[0, \infty[$.

(d) MF ch.2.2: True or false?
- $\forall\, y \in \mathbb{Z}\ \ y + 5 \in \mathbb{Q}$ **True**
- $\forall\, y \in \mathbb{Q}\ \ y + 5 \in \mathbb{Z}$ **False**
- $\exists\, y \in \mathbb{Z}$ s.t. $y + 5 \in \mathbb{Q}$ **True**
- $\exists\, y \in \mathbb{Q}$ s.t. $y + 5 \in \mathbb{Z}$ **True**
- $\exists!\, y \in \mathbb{Z}$ s.t. $y + 5 \in \mathbb{Q}$ **False**
- $\exists!\, y \in \mathbb{Q}$ s.t. $y + 5 \in \mathbb{Z}$ **False**
- x is a rose $\Rightarrow$ x is a flower **True**
- x is a flower $\Rightarrow$ x is a rose **False**
- x is a flower $\Leftrightarrow$ x is a rose **False**
- $x + y = 12 \ \Rightarrow\ x + y = 6 + 6$ **True**
- $x + y = 6 + 6 \ \Rightarrow\ x + y = 12$ **True**
- $x + y = 6 + 6 \ \Leftrightarrow\ x + y = 12$ **True**

(e) Check those numbers that are elements of $\mathbb{Q}$.
$-\frac{13}{8}$ ✓ $\frac{24}{8}$ ✓ 0.3 ✓ 3.0 ✓ -13 ✓ $16.6\bar{6}$ ✓ $16.66\bar{6}6$ ✓
$-\sqrt{2}$ ___ all $x \in \mathbb{N}$ ✓ all $x \in \mathbb{R}$ ___ all $x \in \mathbb{Z}$ ✓