Math 243: Mathematical Structures, Spring 2020   Prof. Ballantine

Homework Assignment # 2
DUE: Thursday, February 6, at the **beginning** of class

The numbered exercises refer to the manuscript *Mathematical Structures*. Always justify all assertions.

1. Exercise 1.34 parts (c) and (d).

2. Exercise 1.35 part (b). Just use truth tables (no need for the Venn diagrams)

3. Prove or disprove:

   (a) $3\mathbb{Z} \subseteq 2\mathbb{Z}$.

   (b) $4\mathbb{Z} \subseteq 2\mathbb{Z}$.

   (c) $2\mathbb{Z} \subseteq 4\mathbb{Z}$.

4. Determine the following sets, where subsets A, B, C of the universal set $\mathcal{U} = \{0, 1, 2, 3, 4, \ldots, 9, 10\}$ are given below:

   $A = \{0, 2, 4, 6, 8, 10\}$, $B = \{2, 3, 5, 7\}$, and $C = \{0, 1, 2, 3, 4, 5\}$,

   (a) $A \cap C$
   (b) $A \cap B \cap C$
   (c) $A \cup (B \cap C)$
   (d) $(A \cup B^c)^c$

5. Let A, B, and C represent arbitrary sets in the same universal set $\mathcal{U}$. Decide whether or not each statement is true. If false, give a specific counterexample. If true, explain in a sentence or a Venn diagram. (You need not give a formal proof.)

   (a) $A \cap \varnothing = A \cup \varnothing$.
   (b) $A \cap (B \cup C) = (A \cup B) \cap C$.
   (c) If $A \cup B = A \cup C$, then $B = C$.