

MATH 321: HOMEWORK 1
DUE THURSDAY, SEPT 10 BY 11:59PM

Problem 1. Do exercise 10 from section 1.4 of the textbook (page 43).

Problem 2. Consider the sets $A = \{0, 1, 2, 3\}$, $B = \{1, 3, 6\}$, and $C = \{0, 2, 4, 6\}$. List the elements of the following sets.

- $A \cap B$
- $(A \cup C) \setminus B$
- $(A \cup B) \setminus (A \cap C)$

Problem 3. Analyze the logical form of the following statements by translating them into formulae in quantificational logic.

- Nobody loves everybody.
- Everyone loves someone.
- No matter who you are, if you love someone else then you love yourself.

Problem 4. Consider the following logical formula.

$$\forall z (z \in y \leftrightarrow [\forall w (w \in z \rightarrow \in x)])$$

Identify the variables in this formula. Which are free and which are bound? Translate this formula into a sentence in ordinary mathematical English. [Hint: first translate it into a formula using \subseteq .]

Problem 5. Express the statement “ p is a prime number” as a formula in quantificational logic, using the natural numbers \mathbb{N} as the universe of discourse.