

Homework 1 – MATH 2510 Spring 2018

1. Let $X = \{1, 2, 3\}$, $Y = \{2, 3, 4\}$, and $Z = \{1, 2, 3, 5, 7\}$.
 - (a) Is $2 \in X$? Is $2 \in Y$? Is $2 \in Z$?
 - (b) Is $X \subseteq Y$? Is $X \subseteq Z$? Is $Y \subseteq Z$? Is $Z \subseteq X$? Is $Z \subseteq Y$?
 - (c) What is $X \cup Y$? What is $X \cup Z$? What is $Y \cup Z$? What is $X \cup Y \cup Z$?
 - (d) What is $X \cap Y$? What is $X \cap Z$? What is $Y \cap Z$? What is $X \cap Y \cap Z$?
 - (e) What is $X \times Y$?
2. Let $X = \{1, 2, 3\}$ and $Y = \{4, 5, 6\}$. Let $R \subset X \times Y$ be a relation given by $R = \{(1, 5), (1, 6), (2, 6), (3, 6)\}$. Is R a function? Why or why not?
3. Is the following string of symbols a formula of propositional logic?

$$(A \wedge B) \wedge ((\neg A) \wedge B)$$

4. Is the following string of symbols a formula of propositional logic?

$$(A \wedge \neg) \wedge (A \wedge (B \wedge \neg A)).$$

5. Prolog exercise. Consider the Prolog code `family.pl` at <https://github.com/tomcuchta/math2510spring2018/blob/master/family.pl>. Copy this code to SWISH.
 - (a) What code do you run to check if Bob is a sibling of Joe? What is the result when it is run?
 - (b) What code do you run to check if Tim is a sibling of Alice? What is the result when it is run?
 - (c) What code can you use to define the "brother of" relation?
 - (d) What code can you use to define the "uncle of" relation?