MATH 2001
INDEXED SETS

Homework. Due Friday, February 5 at 6pm.

- Respond to the poll: if you haven't done so already

- Read Sections 1.8 from the text.

- Complete the following exercises (add these to your Overleaf file with the other book problems).

    - Section 1.8: 2, 3, 4, 6, 9.

Exercise 1. Suppose $A_1 = \{a, b, c\}$, $A_2 = \{c, d, f\}$, and $A_3 = \{b, c, e\}$. Then

i. $\displaystyle\bigcup_{i=1}^{3} A_i =$

ii. $\displaystyle\bigcap_{i=1}^{3} A_i =$

Exercise 2. Sketch each of the following sets (in $\mathbb{R}$ or in $\mathbb{R}^2$).

i. $\displaystyle\bigcup_{n\in\mathbb{N}} \{(n, n)\}$

ii. $\displaystyle\bigcup_{n\in\mathbb{N}} \{n, -n\}$

iii. $\displaystyle\bigcup_{x=3}^{5} ([1, x] \times \mathbb{R})$

iv. $\displaystyle\bigcap_{n=2}^{4} [n^{-1}, n]$

v. $\displaystyle\bigcap_{n=1}^{\infty} (-n, n]$.

Exercise 3.

Let A be a set, and consider the following sets derived from A:

$$X_1 = \{x : x \subseteq A\} \qquad X_2 = \bigcup_{x \in X_1} x \qquad X_3 = \bigcup_{x \in X_1} \{x\}$$

$$X_4 = \{x : x \in A\} \qquad X_5 = \bigcup_{x \in X_4} x \qquad X_6 = \bigcup_{x \in X_4} \{x\}.$$

(1) Translate the definitions of X_1 and X_2 into English phrases. (How would you read each statement out loud? "X_1 is ...")

(2) Write out the sets $X_1, X_2, \ldots, X_6$ in the case where $A = \{\mathbb{N}, \mathbb{Z}\}$.

(3) Given an arbitrary set A, one of the X_i has a nonsensical definition. Which set is it, and why does its definition not make sense?

(4) Given a set A for which all of the X_i are defined, which statement *best* describes each set? (Write X_1 next to the statement that best describes it, etc.)

(a) X_i is a subset of A.   (c) A is a subset of X_i.

(b) X_i is equal to A.   (d) None of the above.