MATH 240 Module 4: Sets

due Friday, 24 Feb 2023

Learning Goals

- Describe sets by listing their elements, using ellipsis notation, and writing set comprehensions.
- Understand and compute with the empty set, subset relation, set equality, Cartesian product, and power sets.
- Use Disco to evaluate set expressions and write set comprehensions.
- Write proofs about sets.

Submission

You should submit two files:

- A PDF with your answers to the exercises (you may either type your answers and export as a PDF, or write your answers by hand and scan them using an app such as GeniusScan or CamScanner). Note that you **must** submit a PDF! Submissions in any other format (`.docx`, `.pages`, ...) will need to be resubmitted. If you are not sure how to create a PDF document please ask for help!
- A completed version of `module4.disco`; see `https://replit.com/@BrentYorgey/Discrete-Math-Module-4`.

Exercises

Exercise 1 Let A, B, and C represent the following sets:

$$A = \{5, 8, 13, 20\}$$
$$B = \{n \mid n \in \mathbb{N} \wedge n < 10\}$$
$$C = \{10k \mid k \in \mathbb{Z}\}$$

Write out the elements in the sets corresponding to each expression below.

(a) $A - B$

(b) $B \cap C$

(c) $A \cap B \cap C$

(d) $\{x \mid (x \in C \cup A) \wedge (|x| \leq 10)\}$

(e) $A \times \{r, s\}$

(f) $\mathcal{P}(A - \{20\})$

Exercise 2 Prove that for all sets S, T, and U,

$$S \cap (T \cup U) = (S \cap T) \cup (S \cap U).$$

Disco

You must also complete Disco programming **Exercises D1, D2, and D3**: see `https://replit.com/@BrentYorgey/Discrete-Math-Module-4`.