

Feel free to work with other students on these problems. However all written work should be your own. Also, be sure to give written credit, on the assignment, for any ideas you get from other people.

All proofs should be as short and clear as possible. If you deviate from the style of proof given in the notes you should only do so consciously and for good reason.

**Exercise 2.1.** Let  $\mathcal{B}$  be a nonempty set of sets and let  $A$  be any set. Show that

(b).  $A \cap \bigcup \mathcal{B} = \bigcup \{A \cap B \mid B \in \mathcal{B}\}$

(d).  $A \setminus \bigcap \mathcal{B} = \bigcup \{A \setminus B \mid B \in \mathcal{B}\}$

**Exercise 2.2.** Show that if  $f: A \rightarrow B$  and  $g: B \rightarrow C$  are injections then  $g \circ f$  is also an injection. Does the converse hold?

**Exercise 2.3.** Suppose that  $A, B$  are sets. Show that  $A \times B$  is in bijection with  $B \times A$ . Find explicit sets  $A$  and  $B$  so that  $A \times B \neq B \times A$ .

**Exercise 2.4.** Suppose that  $A, B$  are sets. Recall that  $B^A = \{f: A \rightarrow B\}$  is the set of functions from  $A$  to  $B$ . Let  $2 = \{0, 1\}$ . Find a bijection between the power set  $\mathcal{P}A$  and the set of functions  $2^A$ .