

MATHEMATICS 2001
GROUPWORK DUE SEPTEMBER 23

TASKS

Reminder: you should produce a Groupwork Report (handwritten is fine) and a PDF uploaded to D2L (typset, LaTeX or Word or whatever).

Reminder: elect a leader, scribe and presenter.

- (1) Reminder: You should still probably be able to elect a scribe and presenter who has not yet scribed or presented. If you were elected presenter but did not actually present in class, that doesn't count as having presented, so you may be elected again.
- (2) **Main Task 1: Take up homework done so far.** As in previous weeks.
- (3) **Main Task 2: Group Homework.**

- (a) Let's revisit this fact for any sets A , B and C :

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C).$$

First, convince yourself once again that this is true by writing a Venn diagram (no need to hand this in).

- (b) Now, write a formal proof that for any sets A , B and C ,

$$A \cap (B \cup C) \subseteq (A \cap B) \cup (A \cap C).$$

- (c) Now, write a formal proof that for any sets A , B and C ,

$$A \cap (B \cup C) \supseteq (A \cap B) \cup (A \cap C).$$

- (d) Now, put the last two parts together (just cut-and-paste and add some surrounding explanation) to give a formal proof that for any sets A , B and C ,

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C).$$

- (e) If you're meeting early in the week, we may not have spent much time on the notion of contrapositive. In that case, consider the two statements, 'Anyone in this bar who is drinking beer is at least 21' and 'Anyone in this bar who is younger than 21 is not drinking beer.' Do they say the same thing? Are they logically equivalent? Look up the meaning of *contrapositive* in your text and learn what it means.
 - (f) Write the *contrapositive* of the following statements:
 - (i) If the drink is yellow, it is poisonous.
 - (ii) If x is an integer in the set A , then x is even.
 - (iii) If a does not divide b , then both x and y are even.
 - (g) Give a proof of this statement: Let a and b be integers. If $4 \mid (a^2 + b^2)$, then at least one of a and b is even. Hint: Use the contrapositive.
- (4) Fill out your groupwork report and have everyone sign. **This is due in class.**
 - (5) The scribe will prepare a PDF of your proofs to hand in on D2L. **I appreciate getting these early on Friday so I can look through them.**