

## MATH 113 Homework 1: Sets and mappings

Due in class on Thursday, September 7

1. In class we proved a distributive property for set unions and intersections. Now describe an associative property for set intersections and prove this property.
2. Is set containment an equivalence relation? (Explain your answer.)
3. If  $a \equiv 2 \pmod{4}$  and  $b \equiv 3 \pmod{4}$ , then  $ab$  is congruent to what mod 4? (Explain your answer.)
4. Does a bijection from  $\mathbb{Q}^+$  to  $\mathbb{Z}$  exist? If so, describe it. If not, why not?  
What about an injection which is not surjective?  
A surjection which is not injective?
5. Why did you choose to take this course and what do you hope to get out of it?

### Group Problem (Presentation Tuesday, September 5)

Let  $S$  be a set, and let  $\mathcal{P}(S)$  be the set of all subsets of  $S$ , called the **power set** of  $S$ .

1. Can you find a bijection from  $\mathcal{P}(\mathbb{Z})$  to a set we talked about in class?
2. Prove that for any set  $S$  (finite or infinite) it is impossible to find a mapping of  $S$  **onto**  $\mathcal{P}(S)$ .