MATH 250 PRACTICE EXAM 2

The second exam will be seven questions, 5/7 of which will be nearly identical to the homework problems. The other two will not be nearly identical, but solvable using the exact same techniques.

There will be one problem from chapter 3, and it will be one of the problems from HO13 that were assigned for homework or were worked in class.

One problem will ask you to give a definition, or will be true/false, or will be of the form "which of the following expressions make mathematical sense", or will ask you to compute without proof intersections, unions, preimages, or images.

Here is a sample of what to expect.

(1) Let $f\colon A \to B$ be a function. Let $X \subset A$ and $Y \subset B$.
   (a) Give a definition of $f(X)$.
   (b) Which of the following are meaningful mathematical expressions?
      (i) $f(X)$.
      (ii) $f(Y)$.
      (iii) $f^{-1}(Y)$,
      (iv) $f^{-1}(X)$

(2) Let A and A_i be sets and suppose that for every $i \in \mathbb{Z}_{>0}$, $A \supset A_i$. Prove that

$$A \supset \bigcup_{i=1}^{\infty} A_i.$$

(3) Let $f\colon A \to B$ be a function and let X, Y be subsets of A. Prove or disprove:
   (a) $f^{-1}(X \cap Y) \supset f^{-1}(X) \cap f^{-1}(Y)$.
   (b) $f^{-1}(X \cap Y) \subset f^{-1}(X) \cap f^{-1}(Y)$.