Mth 355 Assignment 1 Fall 2001 | Due: Oct 8, 2001

Bent Petersen 355f2001-assign-001.tex

Let X be a set. Recall we define the power set $P(X)$ of X as the set of all subsets of X,

$$P(X) = \{ A \mid A \subset X \}.$$

Recall we saw in class

Proposition 1. *If X is a nonempty set and $f : X \to P(X)$ then f is not epimorphic (surjective, onto).*

Proof. Let

$$A = \{ x \in X \mid x \notin f(x) \}.$$

If $A = f(y)$ for some $y \in X$ then $y \in A$ if and only if $y \notin A$. This contradiction shows A is not in the range of f. □

Problem 1. Use the proposition above together with a grubby argument, or come up with your own elegant argument, to prove the following proposition.

Proposition 2. *If X is a nonempty set and $f : P(X) \to X$ then f is not monomorphic (injective, one-to-one).*