

# Math 2001 Assignment 34

Your name here

Due Friday, November 14

**Reading 1.** Scheinerman, §25 (pp. 167–175)

**Problem 2.** Suppose  $A$  and  $B$  are sets. In class we defined  $|A| \leq |B|$  if there is an injection from  $A$  to  $B$ . Is it true that  $|A| \leq |B|$  if there is a surjection from  $B$  to  $A$ ? Justify your answer.

**Problem 3.** Fix a finite set  $S$  of size  $n$  and a second natural number  $k$ . Let

$$A = \{T \in 2^S : |T| = k\}$$
$$B = \{U \in 2^S : |U| = n - k\}$$

For each  $T \in A$ , let  $f(T) = S - T$ . For each  $U \in B$ , let  $g(U) = S - U$ .

- (i) Prove that  $f$  is a function from  $A$  to  $B$  and that  $g$  is a function from  $B$  to  $A$ . (Think carefully about what you need to prove here.)
- (ii) Prove that  $f$  and  $g$  are inverse functions.
- (iii) Conclude that  $|A| = |B|$ .