Home Assignment 8

Discrete Mathematics – CSC/MAT A67, Winter 2024

PROOF BY CONTRAPOSITIVE

Prove each of the following statements by proving its contrapositive statement. For each proof, state the contrapositive assumption that you are proving, explicitly and fully.

(The main goal of this question is to practice structuring proofs by contrapositive, and in particular negating statements.)

1. Let $S_1,\ldots,S_n$ be sets of natural numbers. Prove by the contrapositive method that:

   $(\exists\ i \in [n], |S_1 \cap S_2 \cap \ \ldots \cap\ S_n| \geq |S_i|) \Rightarrow (\exists\ i \in [n],\ \forall j,k \in [n], |S_j \cap S_k| \geq |S_i|)$

   We prove the contrapositive statement: