### Proof by Contraposition

the laws of logic. Instead of proving a statement of the form A → BB , you instead prove theA → BA¬A Another popular method of proof is proof by contraposition. This approach is based on

lows the statement B, but instead that from the statement “not ¬B → ¬A ” follows the statement “not A.” The negation, formally written as ¬B , is logically equivalent to negated expression. This means that one does not show that from the statement fol-

and is occasionally easier to prove than the original statement. In the case of proof by contraposition, one assumes that is valid, and concludes from this the correctness of .

Example: Proof by contrapositionLet n ∈ ℕ. If n2 is an odd number, then n is also odd.

Proof:

We prove this assertion by contraposition. The negation of the statement is: If Let then natural number. n2 is not odd either. In other words: If □ n is even, then nn2 as is also even.n = 2k. Obviously with a natural num-n k'n is not odd, is an even

natural number, therefore so is ber nk ∈ ℕ be an even natural number. Then we can represent . Thus n2 = 22 ⋅ k2 = 2 ⋅ 2 ⋅ k2k'. Because 2 = 2k'n2 = 2k' with , it follows that k' := 2k2 2 is also an even