**Mathematical Writing, WS 2014/15 — Additional Exercise**

October 30, 2014

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Assume that we have proved the following lemmas:

> Lemma 1. $A$ implies $C$.
> Lemma 2. If $B$ does not hold, then $A$ must hold.
> Lemma 3. From $B$ we can conclude $C$.

Consider the following proof of $C$, which is based on these lemmas:

> *Proof:* We distinguish two cases:
>
> - Case I: $A$ holds. We apply Lemma 1, and we are done.
> - Case II: $A$ does not hold. In this case we consider two subcases:
>   - Case IIa: $B$ does not hold. Then we apply Lemma 2 and conclude $A$, in contradiction to the assumption of Case II. Therefore we need not consider this case.
>   - Case IIb: $B$ holds. By Lemma 3, we obtain $C$. □

Analyze the logical structure of this proof. Can you find a simpler structure for the proof of $C$?