Set Theory (P)

Prove:

Prove that for all sets $A \backslash (B \cup C) = (A \backslash B) \cap (A \backslash C)$.

proof

$$
\begin{array}{rcll}
A \backslash (B \cup C) & = & A \cap (B \cap C)^c & \text{(Definiton of } \backslash\text{)} \\
& = & A \cap (B^c \cup C^c) & \text{(de Morgan's Laws)} \\
& = & A \cap A \cap (B^c \cap C^c) & \text{(Idempotence of } \cap\text{)} \\
& = & A \cap (A \cap B^c) \cap C^c & \text{(Associativity of } \cap\text{)} \\
& = & A \cap (B^c \cap A) \cap C^c & \text{(Communitativity of } \cap\text{)} \\
& = & (A \cap B^c) \cap A \cap C^c & \text{(Associativity of } \cap\text{)} \\
& = & (A \backslash B) \cap A \cap C^c & \text{(Definiton of } \backslash\text{)} \\
& = & (A \backslash B) \cap (A \backslash C) & \text{(Definiton of } \backslash\text{)}
\end{array}
$$