Math 552
Homework 1

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Assume that for some $a \in \mathbb{N}$, $(a+b)+c = a+(b+c)$. Then we will show that $((a++)+b)+c = (a++)+(b+c)$. So,

$$\begin{aligned}
((a{+}{+})+b)+c &= ((a+b){+}{+})+c && \text{by adding } a{+}{+} \text{ and } b \\
&= ((a+b)+c){+}{+} && \text{by adding } (a+b){+}{+} \text{ and } c \\
&= (a+(b+c)){+}{+} && \text{by induction hypothesis} \\
&= (a{+}{+})+(b+c) && \text{by reversing addition with } a{+}{+} \text{ and } (b+c)
\end{aligned}$$