Question 1. *Prove if* $|x_n - L| \leq b_n$ *and* $\lim b_n = 0$*, then* $\lim x_n = L$*.*

Solution. Note that $|x_n - L| \leq b_n$ implies $b_n \geq 0$. Since $\lim b_n = 0$, for each $\varepsilon > 0$ there is $N \in \mathbb{N}$ such that $0 \leq b_n < \varepsilon$ for all $n > N$. Then $|x_n - L| \leq b_n < \varepsilon$ for all $n > N$. By definition this means that $\lim x_n = L$. $\square$