Suppose that $a_n \to a$ and that $d$ is a limit point of $\{b_n\}$. prove that $d$ is a limit point of the sequence $\{a_n b_n\}$.

Proof: Since $d$ is a limit point of $\{b_n\}$ this sequence has a subsequence $\{b(n_k)\}$ that converges to $d$. But then the subsequence $\{a(n_k) b(n_k)\}$ converges to $ad$, so $ad$ is a limit point of $\{a_n b_n\}$. 