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Suppose that  $a_n \rightarrow a$  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  $\{a_n b_n\}$ .