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1. False. Assume $x_n = \{\frac{1}{n}\}_{n=1}^{\infty}$ and $y_n = \{n\}_{n=1}^{\infty}$. Then, $\{x_n\}$ converges to zero while $\{y_n\}$ diverges. However, multiplying x_n and y_n , we get a sequence which only contains the number one.
 2. (a) $\{\frac{\pi}{\pi+\frac{1}{n}}\}$
(b) $\{\frac{\pi}{n}\}_{n=1}^{\infty}$