P3.5.3 Let $X$ be a metric space and fix $\delta \in \mathbb{R}^+$. 

Part (a): Let $\delta = 1$ and let $K = \{x \in \mathbb{R}^2 : x = (0, n), \text{ for all } n \in \mathbb{N}\}$, i.e. $x = (0,1), (0,2), (0,3), \ldots$.

Part (b): Let $K$ be a $\delta$-separated subset of $X$ such that $\delta \in \mathbb{R}^+$. So assume $(s_n) \subset K$ such that $(s_n)$ converges to $x$ for $x \in X$. Then by definition, for all $\varepsilon > 0$, there is an $N \in \mathbb{N}$ such that if $n > N$ then $d(s_n, x) < \varepsilon$. Choose $\varepsilon \in \mathbb{R}^+$ such that $\varepsilon < \frac{\delta}{2}$, and observe that $d(s_n, x) < \varepsilon$ and implies $d(s_n, x) < \frac{\delta}{2}$. Observe that $d(s_{n+1}, x) < \frac{\delta}{2}$ as well.

Since $K$ is $\delta$-separated, $d(s_n, s_{n+1}) \geq \delta$. So, by the triangle inequality, we have $d(s_n, s_{n+1}) \leq d(s_n, x) + d(s_{n+1}, x)$. But, $d(s_n, x) < \frac{\delta}{2}$ and $d(s_{n+1}, x) < \frac{\delta}{2}$, and also $\delta \leq d(s_n, s_{n+1})$. But then we have $\delta < \delta$, a contradiction. Therefore, $(s_n)$ does not converge to $x$, and then $x$ is not a limit point of $K$. 