Problem 1 Spivak 6.14

Problem 2 Spivak 6.15

Problem 3
(i) Spivak 7.10
(ii) Spivak 7.11

Problem 4 Spivak 8.5

Problem 5 Spivak 8.6

Problem 6 Spivak 8.7

Problem 7 Spivak 8.8

Problem 8
(i) Spivak 8.14 (a)
(ii) Assume in addition that for any $\varepsilon > 0$, there is some $N \in \mathbb{N}$ such that $b_N - a_N < \varepsilon$. Show that this implies that the point $x$ from part (i) is unique.
(iii) Spivak 8.14 (b)

Problem 9* (extra credit) Let $I$ be an interval. A function $f: I \to \mathbb{R}$ is called uniformly continuous if for any $\varepsilon > 0$, there is $\delta > 0$, such that $|x - y| < \delta$ implies $|f(x) - f(y)| < \varepsilon$. (Note that we ask for more here than in the definition of continuity!) Show that if $f: [a, b) \to \mathbb{R}$ is uniformly continuous, there is a continuous function $\bar{f}: [a, b] \to \mathbb{R}$, such that $f = \bar{f}$ on $[a, b)$.