1. Complete these problems from the book:
   (a) pg. 109, Exercise 3.2.10
   (b) pg. 115, Exercise 3.3.4, Exercise 3.3.7
   (c) pg. 120, Exercise 3.4.3, Exercise 3.4.4
2. A function $f : D \subset \mathbb{R} \to \mathbb{R}$ is called *(sequentially) lower semicontinuous* at a point $x \in D$ if we have

$$f(x) \leq \liminf_{D \ni y \to x} f(y),$$

in the sense that for any sequence $(y_n)_{n\in\mathbb{N}} \subset D$ with $\lim_{n\to\infty} y_n = x$ we have

$$f(x) \leq \liminf_{n\to\infty} f(y_n).$$

In a similar spirit, a function is called *(sequentially) upper semicontinuous* if

$$f(x) \geq \limsup_{D \ni y \to x} f(y).$$

   (a) Give an example of a lower semicontinuous function which is not continuous.
   (b) Give an example of an upper semicontinuous function which is not continuous.
   (c) Show that f is continuous at $x \in D$ if and only if f is lower and upper semicontinuous at x.
   (d) Show that if $f : [a, b] \to \mathbb{R}$ is lower semicontinuous in every $x \in [a, b]$, then f attains its minimum value in $[a, b]$.
   (e) Show that if $f : [a, b] \to \mathbb{R}$ is upper semicontinuous in every $x \in [a, b]$, then f attains its maximum value in $[a, b]$.