3.2.1(a) (2 pts) In the proof we let \( \epsilon = \min \{ \epsilon_1, ..., \epsilon_N \} \). If the set of \( \epsilon_i \) was infinite, then \( \epsilon \) may be 0.

3.2.1(b) (2 pts) Let \( \mathcal{O}_i = (\frac{-1}{n}, \frac{1}{n}) \). Then \( \bigcap_{i \in \mathbb{N}} \mathcal{O}_i = \{0\} \).

3.2.2 (5 pts) (a) Limit points are \(-1\) and 1. (b) No. (c) No. (d) Yes. (e) \( \overline{B} = B \cup \{-1, 1\} \).

3.2.7 (3 pts) Let \( x \in \mathcal{O} \) where \( \mathcal{O} \) is open. Then there exists some \( \epsilon > 0 \) such that \( V_\epsilon(x) \subset \mathcal{O} \). If \( x_n \to x \) as \( n \to \infty \), then there exists some \( N \in \mathbb{N} \) such that \( |x_n - x| < \epsilon \) for all \( n \geq N \). Hence, there are at most a finite number of terms in the sequence not contained in \( \mathcal{O} \).

3.2.9(a) (3 pts) Let \( y \) be a limit point of \( A \cup B \). Then there exists some \( \{y_n\} \subset A \cup B \) such that \( y_n \to y \). \( A \) or \( B \) will contain an infinite number of elements of \( \{y_n\} \). So there is a subsequence contained in \( A \) or \( B \). Hence, \( y \) is a limit point of \( A \) or \( B \).

3.2.9(b) (3 pts) Let \( x \in \overline{A \cup B} \). Then \( x \in A \cup B \) or a limit point of \( A \cup B \). By the previous result we know that \( x \in A \), \( x \in B \), or \( x \) is a limit point of \( A \) or \( B \). Hence, \( x \in \overline{A \cup B} \).

Let \( x \in \overline{A \cup B} \). Then \( x \in A \), \( x \in B \), or \( x \) is a limit point of \( A \) or \( B \). Hence, \( x \in \overline{A \cup B} \).

3.2.9(c) (2 pts) No. Let \( A_n = \{\frac{1}{n}\} \). Then \( \bigcup_{n \in \mathbb{N}} A_n = \{0\} \cup \bigcup_{n \in \mathbb{N}} A_n \), but \( \bigcup_{n \in \mathbb{N}} \overline{A_n} = \bigcup_{n \in \mathbb{N}} A_n \).