Instructions: Using complete sentences and appropriate notation, either define the given term or expression, or answer the given question.

1. Suppose that \( \langle x_n \rangle \) is an infinite sequence. What does it mean to say that \( \langle x_n \rangle \) is a Cauchy sequence?

2. Provide the definition of the limit superior of a sequence \( \langle x_n \rangle \).

3. Provide the definition of the limit inferior of a sequence \( \langle x_n \rangle \).

4. What does it mean to say that a real number \( l \) is a limit of an infinite sequence \( \langle x_n \rangle \)? [Give me the mathematical, not the informal or intuitive, definition.]

5. What does it mean to say that \( l = \infty \) is a cluster point of the infinite sequence \( \langle x_n \rangle \)?
6. What does it mean to say that a set $U$ of real numbers is open??

7. What does it mean to say that a real number $x$ is a point of closure of a set $E$ of real numbers??

8. What does it mean to say that a collection of sets $C$ covers a set $E$ of real numbers.

9. How is the notion of ‘closed set’ defined??

10. What does it mean to say a sequence of measurable functions $<f_n>$ converges to a function $f$ in measure?
11. Let $E$ be a non-empty subset of $\mathbb{R}$, and suppose that $f: E \rightarrow \mathbb{R}$ is a function. What does it mean to say $f$ is continuous at a point $x \in E$?

12. Suppose that $\langle f_n \rangle$ is a sequence of real-valued functions defined on a non-empty set $E$ and $f$ is a real-valued function defined on $E$. What does it mean to say the sequence $\langle f_n \rangle$ converges pointwise to $f$ on $E$?

13. Suppose that $\langle f_n \rangle$ is a sequence of real-valued functions defined on a non-empty set $E$ and $f$ is a real-valued function defined on $E$. What does it mean to say the sequence $\langle f_n \rangle$ converges uniformly to $f$ on $E$?

14. Suppose that $f: E \rightarrow \mathbb{R}$ is a function with $E \subset \mathbb{R}$. What does it mean to say $f$ is uniformly continuous on $E$?

15. How is the Lebesgue outer measure of a subset $E$ of the real line defined in terms of the length of an interval $l(I)$?
16. How do we define the measurability of a subset $E$ of the real line?

17. Suppose that $A$ is a subset of the real line. What does it mean to say a function $f:A \rightarrow \mathbb{R}$ is measurable??

18. Let $f:[a,b] \rightarrow \mathbb{R}$ be a function. What does it mean to say $f$ is of bounded variation on $[a,b]$ ??

19. What does it mean to say something is true almost everywhere??

20. Let $f:[a,b] \rightarrow \mathbb{R}$ be a function. What does it mean to say $f$ is absolutely continuous on $[a,b]$ ??