Week 2 Assignment

1. Let \( A = \{x \in \mathbb{R} : x < 7\} \). Then supremum of \( A \) is
   
   (A) 7
   
   (B) 3
   
   (C) Does not exist
   
   (D) 0

2. If \( A = \left\{ \frac{1}{m} + \frac{1}{n} : m, n \in \mathbb{N} \right\} \) then supremum of \( A \) is
   
   (A) 1
   
   (B) 0
   
   (C) 2
   
   (D) None of above

3. If \( A = \left\{ \frac{n + (-1)^n}{n} : n \in \mathbb{N} \right\} \) then infimum of \( A \) is
   
   (A) 2
   
   (B) 0
   
   (C) 1
   
   (D) None of above
4. Which is the set of all limit points of natural numbers in $\mathbb{N}$?

(A) $\emptyset$
(B) $\emptyset$
(C) $\mathbb{N} \cup \{0\}$
(D) None of the above.

5. If $A$ is an open set and $B$ is a closed set such that $B \subset A$, then $A$, $B$ is

(A) an open set
(B) a closed set
(C) subset of an open set
(D) subset of a closed set.

6. $S = \left\{ 1 + \frac{1}{n} : n \in \mathbb{N} \right\} \cup \left\{ -1 - \frac{1}{n} : n \in \mathbb{N} \right\}$. Then which of the following is true?

(A) $S$ is an open set
(B) $S$ is a closed set
(C) $\{1, -1\}$ is the set of limit points of $S$.
(D) None of the above.

7. $S = \{-2, 2\} \cup \left\{ \frac{1}{n} : n \in \mathbb{N} \right\} \cup \left\{ -\frac{1}{n} : n \in \mathbb{N} \right\}$. Then which of the following is true?

(A) $S$ is a closed set
(B) S is not a closed set
(C) \{-2, 2\} is the set of limit points of S.
(D) none of the above

8. The derived set of the set of all rational numbers contained in \([1, 2]\) is
   (A) all rational numbers in \([1, 2]\)
   (B) all irrational numbers in \([1, 2]\)
   (C) \([1, 2]\)
   (D) \(\emptyset\).

9. The set \((0, 1), \left\{\frac{1}{2^n} : n = 1, 2, 3, \ldots \right\}\) is
   (A) an open set
   (B) a closed set
   (C) neither an open set nor a closed set
   (D) None of the above.

10. The set \(\left\{\frac{1 + (-1)^n}{n} : n \in \mathbb{N} \right\}\) is
    (A) an open set
    (B) a closed set
    (C) neither an open set nor a closed set
    (D) None of the above.