Do the following sequences converge or diverge?

1. Consider the sequence \( \{b_k\}_{k=1}^{\infty} \) where \( b_k = \frac{k + (-1)^k}{k} \).

   The first five terms of the sequence are:
   \[
   b_1 = \frac{1 + (-1)^1}{1} = 0, \quad b_2 = \frac{2 + (-1)^2}{2} = \frac{3}{2}, \quad b_3 = \frac{3 + (-1)^3}{3} = \frac{2}{3},
   \]
   \[
   b_4 = \frac{4 + (-1)^4}{4} = \frac{5}{4}, \quad b_5 = \frac{5 + (-1)^5}{5} = \frac{4}{5}.
   \]

   In other words, \( \{b_k\}_{k=1}^{\infty} = \{0, \frac{3}{2}, \frac{2}{3}, \frac{5}{4}, \frac{6}{5}, \frac{7}{6}, \frac{8}{7}, \ldots\} \)

   Furthermore, \( \lim_{k \to \infty} \frac{k + (-1)^k}{k} = \lim_{k \to \infty} \left( \frac{k}{k} + \frac{(-1)^k}{k} \right) = \lim_{k \to \infty} \left( 1 + \frac{(-1)^k}{k} \right) = 1. \)

   Therefore, the sequence \( \{b_k\}_{k=1}^{\infty} \) converges to 1.

2. Consider the recursively defined sequence \( \{u_n\}_{n=1}^{\infty} \) where \( u_1 = 1 \) and \( u_{n+1} = 1 - u_n \).

   The first five terms of the sequence are:
   \[
   u_1 = 1 \text{ (given)}, \quad u_2 = 1 - u_1 = 0, \quad u_3 = 1 - u_2 = 1
   \]
   \[
   u_4 = 1 - u_3 = 0, \quad u_5 = 1 - u_4 = 1
   \]

   In other words, \( \{u_n\}_{n=1}^{\infty} = \{1, 0, 1, 0, 1, 0, 1, 0, 1, 0, \ldots\} \)

   Furthermore, \( \lim_{n \to \infty} u_n \) does not exist since the terms oscillate between 0 and 1.

   Therefore, the sequence \( \{u_n\}_{n=1}^{\infty} \) diverges.

**Bonus:** A non-recursive formula that defines the sequence above is \( u_n = \frac{1}{2} \left( 1 + (-1)^{n-1} \right). \)