1. Let \( x_{2n-1} := 2n - 1, x_{2n} := 1/2n; \) that is \( (x_n) = (1, 1/2, 3, 1/4, 5, 1/6, \ldots). \)

6. (a) \( x_{n+1} < x_n \iff (n + 1)^{1/(n+1)} < n^{1/n} \iff (n + 1)^n < n^{n+1} = n^n \cdot n \iff (1 + 1/n)^n < n. \)
   
   (b) If \( x := \lim(x_n), \) then
   
   \[
   x = \lim(x_{2n}) = \lim((2n)^{1/2n}) = \lim((2^{1/n}n^{1/n})^{1/2}) = x^{1/2},
   \]
   
   so that \( x = 0 \) or \( x = 1. \) Since \( x_n \geq 1 \) for all \( n, \) we have \( x = 1. \)

7. (a) \( (1 + 1/n^2)^{n^2} \rightarrow e, \)
   
   (b) \( (1 + 1/2n)^n = ((1 + 1/2n)^{2n})^{1/2} \rightarrow e^{1/2}, \)
   
   (c) \( (1 + 1/n^2)^{2n^2} \rightarrow e^2. \)
   
   (d) \( (1 + 2/n)^n = (1 + 1/(n+1))^n \cdot (1 + 1/n)^n \rightarrow e \cdot e = e^2. \)

10. Choose \( m_1 \) such that \( S \leq s_{m_1} < S + 1. \) Now choose \( k_1 \) such that \( k_1 \geq m_1 \) and \( s_{m_1} - 1 < x_{k_1} \leq s_{m_1}. \) If \( m_1 < m_2 < \ldots < m_{n-1} \) and \( k_1 < k_2 < \ldots < k_{n-1} \) have been selected, choose \( m_n > m_{n-1} \) such that \( S \leq s_{m_n} < S + 1/n. \) Now choose \( k_n \geq m_n \) and \( k_n > k_{n-1} \) such that \( s_{m_n} - 1/n < x_{k_n} \leq s_{m_n}. \) Then \( (x_{k_n}) \) is a subsequence of \( (x_n) \) and \( |x_{k_n} - S| \leq 1/n. \)

12. Choose \( n_1 \geq 1 \) so that \( |x_{n_1}| > 1, \) then choose \( n_2 > n_1 \) so that \( |x_{n_2}| > 2, \) and, in general, choose \( n_k > n_{k-1} \) so that \( |x_{n_k}| > k. \)

16. For example, \( X = (1, 1/2, 3, 1/4, 5, 1/6, \ldots). \)