Q.3. Ans:

Algorithm BinarySerch (A, lower, upper)

Input: Array A, with lower and
        upper index

Output: Returns true if an element
        with $A[m] = m$ exists

$mid \Leftarrow (lower + upper) / 2$

if $(A[mid] = mid)$ then
        return true

else if $A[mid] > mid$ then
        BinarySerch (A, mid+1, upper)

else
        BinarySerch (A, lower, mid-1)

Analysis

    This Algorithm has $O(\log n)$ time complexity. When we talk about the asymptotic relationship, then $\frac{k}{n} \to 0$ when $n \to \infty$. In this case, the algorithm runs in $O(n)$ time.

                Proved.