Magic Index

Example -> {-10, -5, 0, 3, 7}

-> Magic index is an index where arr[i] = i
like in the example -> arr[3] = 3

Brute force -> Linear search when found output it.
T(n) = O(n)

Optimally, we can use Binary search.

-> Here arr[start] < mid
and arr[mid] < mid
So, no chance on left.
But if arr[start] < mid

arr(5) = 3
in this case we know
5 > 3 so,

-> obviously at index 4 value will ≤ 3 so,
there is no chance of finding anything there
so, go and search from arr[3],
compare 4 and arr(mid)
, similarly for
bigger

Consider the arr[] = {-10, -5, 2, 2, 2, 3, 4, 7, 9, 12, 13}, arr[mid] = 3
If elements are not distinct, then we see arr[mid] < mid, we cannot conclude which side the fixed is on.
It could be on left side or on the right side.
We know for sure that since arr[5] = 3, arr[4] couldn't be magic index because arr[4] must be less than or equal to arr[5] (the array is Sorted).
So, the general pattern of our search would be:

- Left Side: start = start, end = min(arr[midIndex], midIndex-1)
- Right Side: start = max(arr[midIndex], midIndex+1), end = end