Palindrome Linked List

Problem

Given the head of a singly linked list, determine if the linked list is a palindrome. A linked list is a palindrome if the sequence of its values reads the same forward and backwards.

Explanation

- A singly linked list is a data structure where each node contains a value and a reference (or pointer) to the next node in the sequence.
- A palindrome is a sequence that reads the same backwards as forward. For example, the sequences "madam" and "racecar" are palindromes.

Constraints

- The number of nodes in the list is between 1 and 100,000.
- Node values are between 0 and 9.

Try to solve this problem in O(n) time and O(1) space.

Test Cases

Test Case 1

- **Input:** head = [1]
- **Output:** true

Explanation: A single node is always a palindrome.

Test Case 2

- **Input:** head = [1, 2, 3, 2, 1]
- **Output:** true

Explanation: The linked list reads 1 -> 2 -> 3 -> 2 -> 1 forward and 1 -> 2 -> 3 -> 2 -> 1 backwards.

Test Case 3

- **Input:** head = [1, 2, 3, 4, 5]
- **Output:** false

Explanation: The linked list reads 1 -> 2 -> 3 -> 4 -> 5 forward and 5 -> 4 -> 3 -> 2 -> 1 backwards, which are not the same.

Reference -

Definition for singly-linked list.

```
struct ListNode {
    int val;
    ListNode *next;
    ListNode() : val(0), next(nullptr) {}
    ListNode(int x) : val(x), next(nullptr) {}
};
```