**Exercise 5: Task Management System**

**Understanding Linked Lists:**

*  **Singly Linked List**:
* Consists of nodes where each node contains a data part and a reference (or link) to the next node in the sequence.
* The last node has a reference to null, indicating the end of the list.
* Allows traversal in one direction (forward).
*  **Doubly Linked List**:
* Each node contains a data part and two references: one to the next node and one to the previous node.
* The first node's previous reference and the last node's next reference are null.
* Allows traversal in both directions (forward and backward).

**Analysis:**

**Time Complexity:**

* Add: O(1) for insertion at the ends; O(n) for a specific position.
* Search: O(n) - requires traversal.
* Traverse: O(n) - visiting each node.
* Delete: O(1) if node is known; O(n) if searching for the node.

**Advantages Discussion:** Linked lists are flexible and handle dynamic data well, though they have overhead due to additional node references. Linked lists can grow and shrink in size dynamically, without the need for reallocation of memory. Insertions and deletions in linked lists can be done in O(1) time if the node reference is known. Even in the worst case, it is O(n), which can be more efficient than the O(n) shift operation in arrays.