**Exercise 5: Task Management System**

**1. Understand Linked Lists:**

* **Singly Linked List:**
  + Each node contains data and a pointer to the next node.
  + Traversal is one-way (from head to tail).
  + Efficient for insertion and deletion at the beginning.
* **Doubly Linked List:**
  + Each node contains data, a pointer to the next node, and a pointer to the previous node.
  + Allows traversal in both directions.
  + More flexible but uses extra memory due to the additional pointer.

**4. Analysis:**

* **Time Complexity of Operations:**
  + **Add (at beginning):** O(1) for both singly and doubly linked lists.
  + **Add (at end):** O(n) for singly, O(1) if tail is maintained; O(1) for doubly if tail is maintained.
  + **Delete (given node reference):** O(1) in doubly; O(n) in singly unless previous node is known.
  + **Search/Traverse:** O(n) for both types, as nodes must be visited sequentially.
* **Advantages Over Arrays:**
  + Dynamic size; no need to declare initial size.
  + Insertion and deletion are efficient at the start or given node (no shifting required).
  + Memory is allocated as needed, which helps avoid memory wastage.
  + Better for applications where frequent insertions and deletions occur.