Remove Nth Node From End of List

Given a linked list, remove the n^{th} node from the end of list and return its head.

For example,

```
Given linked list: 1->2->3->4->5, and n = 2.

After removing the second node from the end, the linked list becomes 1->2->3->5.
```

Note:
Given *n* will always be valid.
Try to do this in one pass.

Solution 1

A one pass solution can be done using pointers. Move one pointer **fast** --> **n+1** places forward, to maintain a gap of n between the two pointers and then move both at the same speed. Finally, when the fast pointer reaches the end, the slow pointer will be **n+1** places behind - just the right spot for it to be able to skip the next node.

Since the question gives that **n** is valid, not too many checks have to be put in place. Otherwise, this would be necessary.

```
   public ListNode removeNthFromEnd(ListNode head, int n) {

    ListNode start = new ListNode(0);
    ListNode slow = start, fast = start;
    slow.next = head;

    //Move fast in front so that the gap between slow and fast becomes n
    for(int i=1; i<=n+1; i++)   {
        fast = fast.next;
    }
    //Move fast to the end, maintaining the gap
    while(fast != null) {
        slow = slow.next;
        fast = fast.next;
    }
    //Skip the desired node
    slow.next = slow.next.next;
    return start.next;
}
```

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Solution 2

```
class Solution
{
public:
    ListNode* removeNthFromEnd(ListNode* head, int n)
    {
        ListNode** t1 = &head, *t2 = head;
        for(int i = 1; i < n; ++i)
        {
            t2 = t2->next;
        }
        while(t2->next != NULL)
        {
            t1 = &((*t1)->next);
            t2 = t2->next;
        }
        *t1 = (*t1)->next;
        return head;
    }
};
```

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Solution 3

```
public ListNode RemoveNthFromEnd(ListNode head, int n) {
    ListNode h1=head, h2=head;
    while(n-->0) h2=h2.next;
    if(h2==null)return head.next;  // The head need to be removed, do it.
    h2=h2.next;

    while(h2!=null){
        h1=h1.next;
        h2=h2.next;
    }
    h1.next=h1.next.next;   // the one after the h1 need to be removed
    return head;
}
```

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