Ques: Given a singly linked list, reverse the linked list.

Eg: ① 1 → 2 → 3 → 4 → 5 → x

output: 5 → 4 → 3 → 2 → 1 → x

curr ↓ 1 → temp ↓ 2 → [3 → 4 → 5 → x]

→ temp. next = curr;

prev → x   1 → 2 → 3 → 4 → 5 → x (prev, curr)

x

while (curr != null) {
① next = curr. next;
② curr. next = prev;
③ prev = curr;
④ curr = next;
}

x ← 1 ← 2 ← 3 ← 4 ← 5 (↓ head)

head = prev;

Q Given a non-empty, singly linked list with head node, return the middle of linked list.

→ If 2 middle elements, return second one.

Eg: 1 → 2 → 3 → 4 → 5 → x
ans → ③

→ 1 → 2 → 3 → 4 → 5 → 6 → x
ans → ④

Approach ①
(a) Find the size of LL
(b) size == even → $\frac{n}{2}+1$
size == odd → $\frac{n}{2}$

```
Node temp = head;
count = 0;
while (temp != null) {
    temp = temp. next
    count ++;
}
```

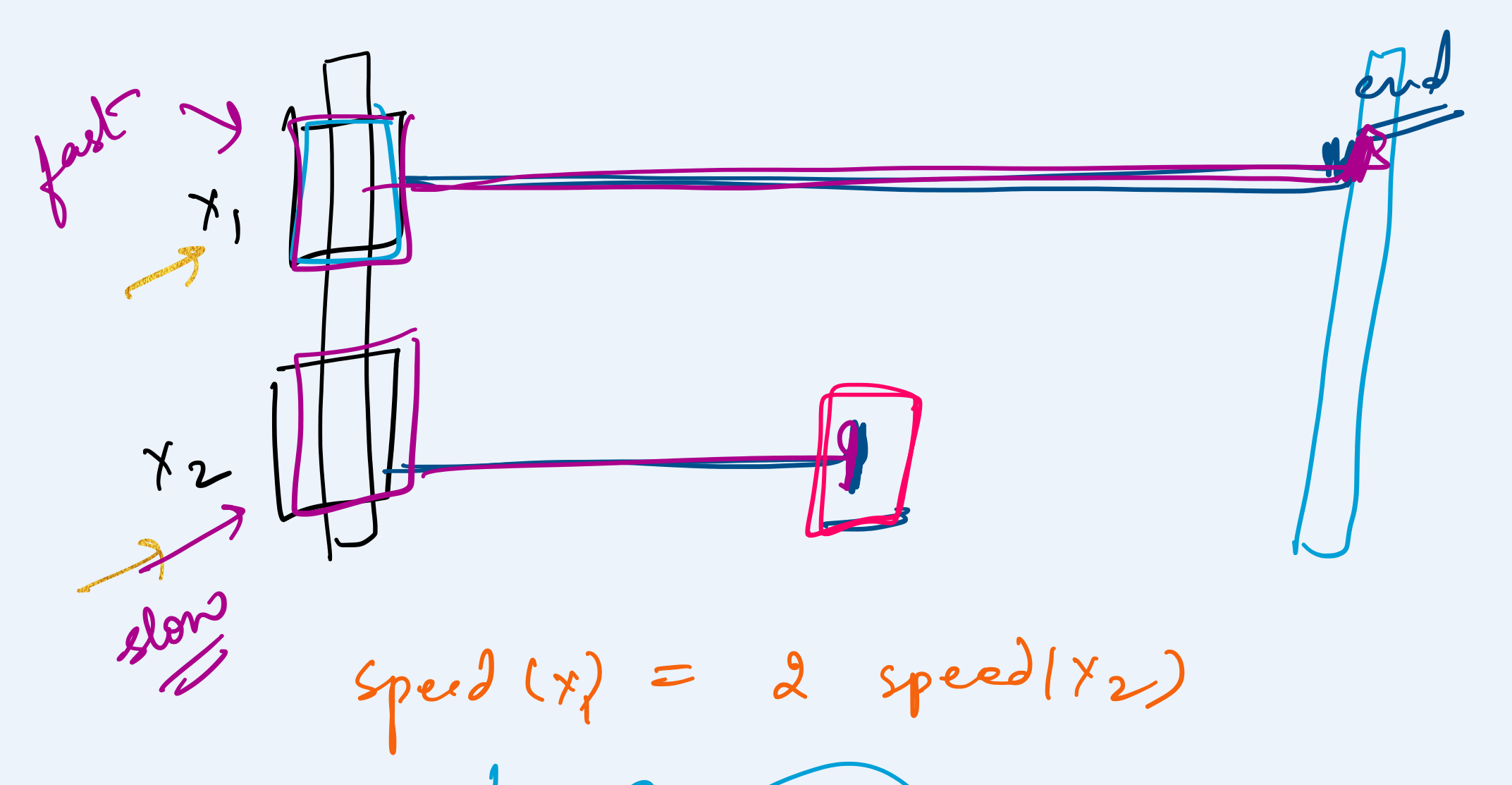
$n + \frac{n}{2} \approx n$

```
Node temp = head;
int itr = 0;
If (count % 2 == 0) {
    itr = count/2 + 1;
}
else {
    itr = count/2;
}

for (int i = 0; i < itr; i++) {
    temp = temp. next;
}
```

head ↓ 1 → 2 → ③ → 4 → 5 → x
return temp. data;

count = 5
→ $\frac{n}{2}$
②



speed (x_1) = 2 speed (x_2)

t = 0

1 → 2 → ③ → 4 → 5 → x (slow at 3, fast at 5)

1st step
2nd itr

fast. next == null

fast.

1 → 2 → 3 → ④ → 5 → 6 → x (slow at 4, fast)

even: (fast != null) && fast. next != null odd

Q given a linkedlist, reorder linked list (folding a list).

$L_0 \to L_1 \to L_2 \to L_3 \ldots \ldots L_{n-1} \to L_n$

$L_0 \to L_n \to L_1 \to L_{n-1} \to L_2 \to L_{n-2}$

Eg: 1 → 2 → 3 → 4 → x
output 1 → 4 → 2 → 3 → x

Eg: 1 → 2 → 3 → 4 → 5 → x
output 1 → 5 → 2 → 4 → 3 → x

1 → 2 → 3 → 4 → 5 → x

Approach

1 → 2 → 3 → [4 → 5] → x

① Find mid of LL   4 – 5 – x   ] slow fast
mid = 3

② Reverse the second half of LL   ] reverse – I, R
1 → 2 → 3 → x
5 → 4 → x

③ Start reordering both LL one by one.   ] merge
1 → 2 → 3 → x
5 → 4 → x

1 → 5 → 2 → 4 → 3 → x

first, temp
1 → 2 → 3 → x
6 → 5 → 4 → x
second

f
1 → 2 → 3 → x
6 → 5 → 4 → x
s

Q (a) Detect a cycle in LL.

head ↓ 3 → ② → 0 → 4 (4 back to 2)   True

1 → 2 → 3 → 4 → x   false

① → 2 (2 back to 1)   true

(b) If cycle exists, find the starting point of cycle.

1 → 2 → ③ → 4 → 5 → 6
↑ 9 ← 8 ← 7