Exercise Sheet 5

Problem 1.

a) · INSERT KEY

① insert node to the end. we call the node to be inserted as e.

```
e.next ← NULL
t ← L.head
while t.next != NULL:
    t ← t.next
t.next ← e
e.prev ← t
```

O(n)

② insert node e at the head.

```
e.prev ← NULL
e.next ← L.head
head.prev ← e
```

O(1)

③ insert node e to a certain index i.

```
t ← L.head
for n = 0 to i
    t ← t.next
e.next ← t.next
    e ← t.next.prev
t.next ← e
e.prev ← t
```

O(n)

b) DELETE KEY

① DELETE the end node e.

```
t ← L.head
while t.next != NULL
    t ← t.next
t.prev.next ← NULL
```

O(n)

② delete the head node e

```
t ← L.head
L.head ← t.next
L.head.prev ← NULL
```

O(1)

⑤ ~~in~~ delete the node e at certain position i.

```
t ← L.head
for n in 0 to i
    t ← t.next
t.next ← t.prev.next
t.next.prev ← t.prev
```

O(n)

b)

```
t ← A.head
while t.next != NULL
    t ← t.next
t.next ← B.head
B.head.prev ← t
```

O(n)

How can this be solved in O(1)?

A.: we could insert the head of B at the end of A (at position n+1)

c)

```
t1 ← A.head
t2 ← B.head
while t1.next != NULL and t2.next != NULL
    t1_next ← t1.next
    t2_next ← t2.next
    t2.next ← t1_next
    t1.next ← t2
    t2.prev ← t1
    ~~t1_next.prev~~
    t1_next.prev ← t2
    t1 ← t1_next
    t2 ← t2_next
B.head ← t2
```

O(n)