Problem 1

a) Insert Algorithm:

```
1: function SEARCH_DOUBLY_LINKED_LIST(L, x)
2:     e ← L.head
3:     while e.key ≠ x and e ≠ NIL do
4:         e ← e.next
5:     end while
6:     return e
7: end function
```

Search Algorithm:

```
1: function INSERT_DOUBLY_LINKED_LIST(L, x)
2:     e ← new element
3:     e.key ← x
4:     e.next ← L.head
5:     L.head.prev ← e
6:     L.head ← e
7:     return L
8: end function
```

b)

```
1: function DOUBLY_LINKED_LIST_APPEND(A, B)
2:     A.tail.next ← B.head
3:     B.head.prev ← A.tail
4:     A.tail ← B.tail
5:     return A
6: end function
```

c)

```
1: function DOUBLY_LINKED_LIST_ZIP(A, B)
2:     i ← 1
3:     a_i ← A.head
4:     b_i ← B.head
5:     while i < n do
6:         ▷ Repointing a_i.next, b_i.prev, b_i.next and a_{i+1}.prev
7:         a_{i+1} ← a_i.next
8:         a_i.next ← b_i
9:         b_i.prev ← a_i
10:        b_{i+1} ← b_i.next
11:        b_i.next ← a_{i+1}
12:        a_{i+1}.prev ← b_i
13:        ▷ Initializing the variables for the next iteration
14:        a_i ← a_{i+1}
15:        b_i ← b_{i+1}
16:        i ← i + 1
17:    end while
```

18:        a_i.next $\leftarrow b_i$
19:        b_i.prev $\leftarrow a_i$
20:        A.tail $\leftarrow B$.tail
21:        **return** A
22: **end function**