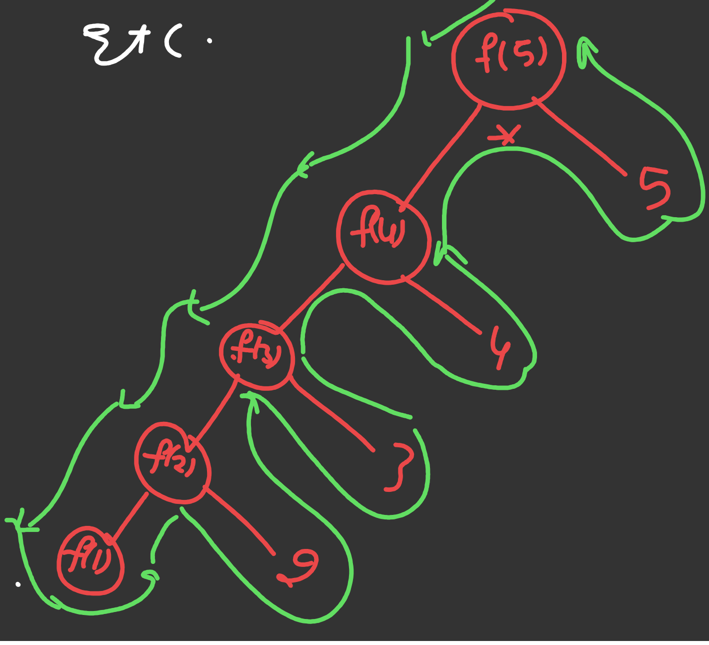
Date
09/01/23

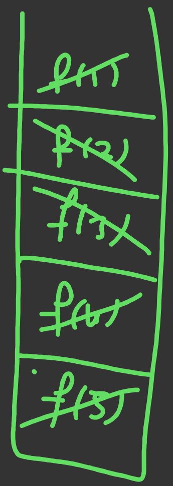
Last Class :: Linked list.

Stack :: Data Structure which follows LIFO

Last In first out.

Tower of hanoi, Set of Collection of plates.
etc.





5 * f(4)
└ 4 * f(3)
  └ 3 * f(2)
    └ 2 * f(1)
      └ ~~2~~ * 1

2
2 * 3
2 * 3 * 4
2 * 3 * 4 * 5

```
f(n)        5 4
{            4*
             5*
  if(n == 1)
     return 1
  return n*f(n-1)
}
```

Why Stack is ADT ::

The following operations make Stack as ADT.

Push (Int);

pop( );

Other operations ::

- Empty/Full
- Peek
- Traverse
-

Applications of Stack.

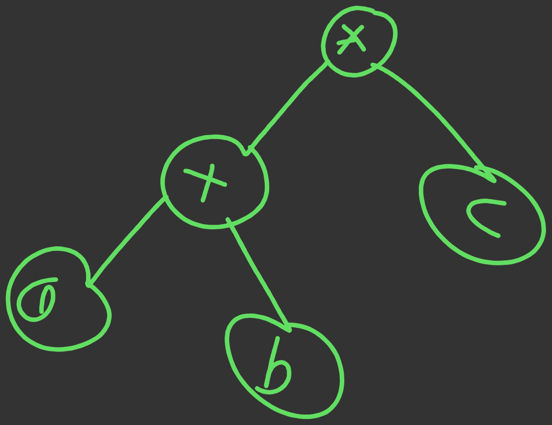
→ Reverse a String

→ Blancing the Symbols.

→ Infix to Postfix

→

a + b * c



§ Implementation ::

1) Array

11) linked lists

Array :: stack[5]

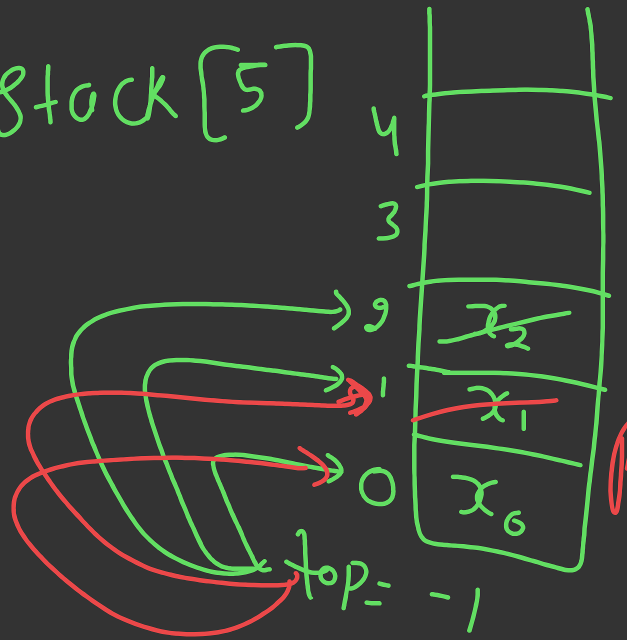
push(x_0)

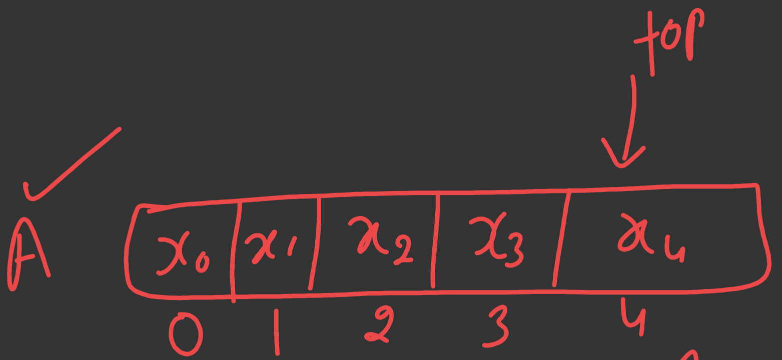
push(x_1)

push(x_2)

pop( )

pop( )

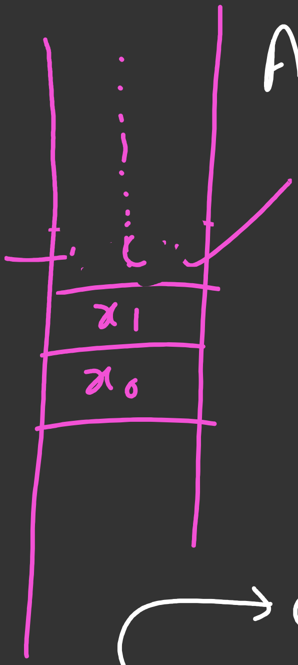




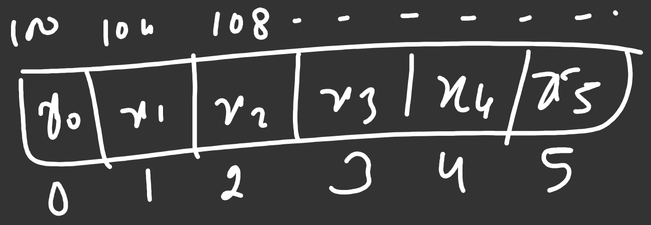
Stack	Array
~~Pop~~ = O(1) ✓	O(n)
~~push~~ / insertion = O(1) ✓	O(n)

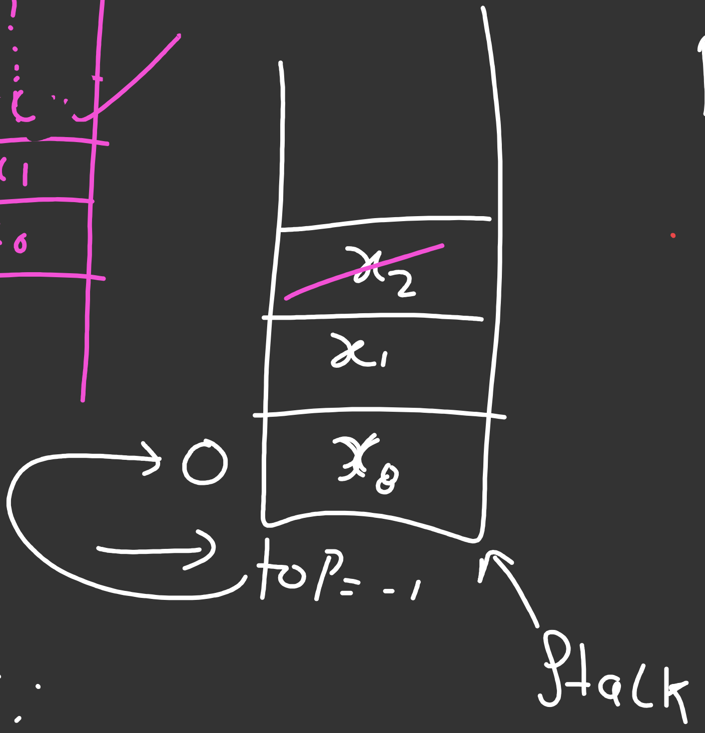
Stack using Array :

```
int stack[6]
int top = -1    x₀
push(int x)
{
    if (top == n-1)
O(1)    overflow ;
    Else
    {
        top++ ;
        Stack[top] = x ;
    }
}
```



A[6]





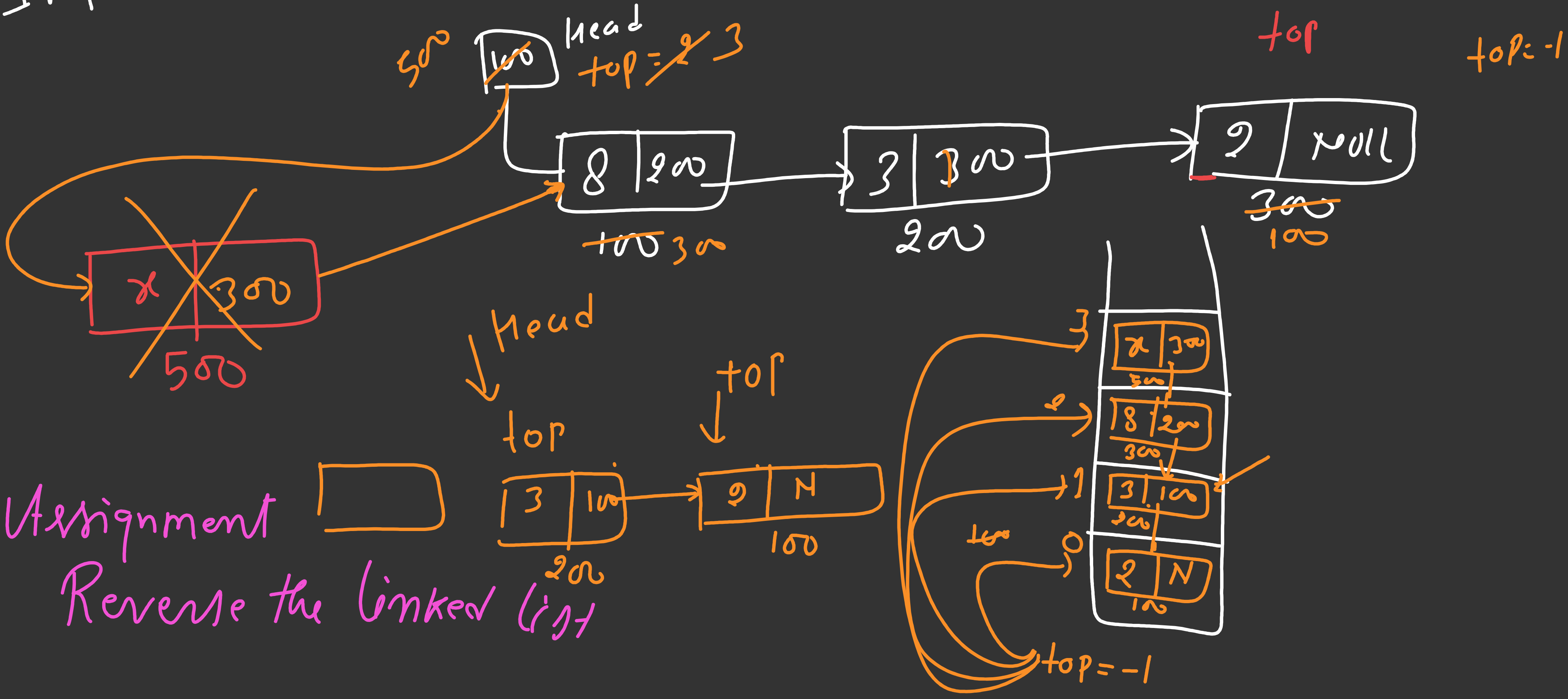
```
pop( )
{
    if (top == -1)
        underflow
    Else
    {
        cout << Stack[top]
        top-- ;
        ~~free(top)~~
    }
}
```

```
peek( )
{
    if(top==-1)
$\theta(1)$     underflow;
    Else
        stack[top]
}

Display( )
{
    int i;
O(n) for(i=top; i≥0; i--)
        {
            pf(stack[i]);
        }
}
```

	Stack	Array
Insertion	$\theta(1)$	$\theta(1)$ / $\theta(n)$
Deletion	$\theta(1)$	$\theta(1)$ / $\theta(n)$
Access	$\theta(1)$	$\theta(1)$
top/peek	$\theta(1)$	$\theta(1)$
Display	$\theta(n)$	$\theta(n)$

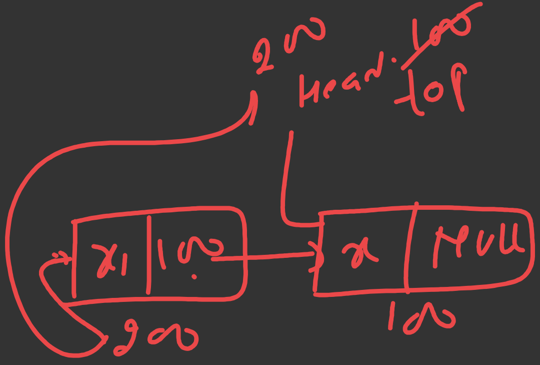
Implementation of Stack using Linked Lists ::

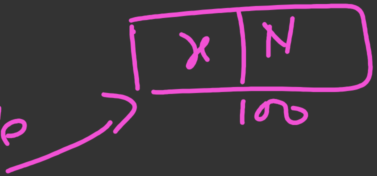


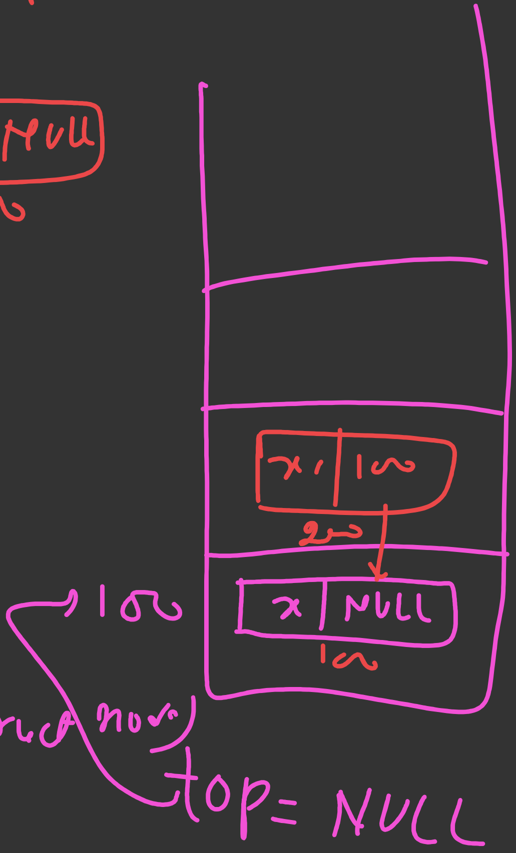
Assignment

Reverse the linked list

```
Struct node
{  int data;
   Struct node *next;
};
Struct node *top = NULL
push ( X )
{  Struct node *newnode
   newnode = (Struct *node) malloc (sizeof(Struct node))
     newnode->data = x
     newnode->next = NULL/top
     top = newnode;
}
```







```
pop(   )
{
    if (top = = NULL)
        underflow
    Else
     {
        temp= top;
         top= top→next;
          free(temp)
     }
}
```

$\boxed{\text{Test = 5 marks.}}$