Full stack web development using python

Recursion

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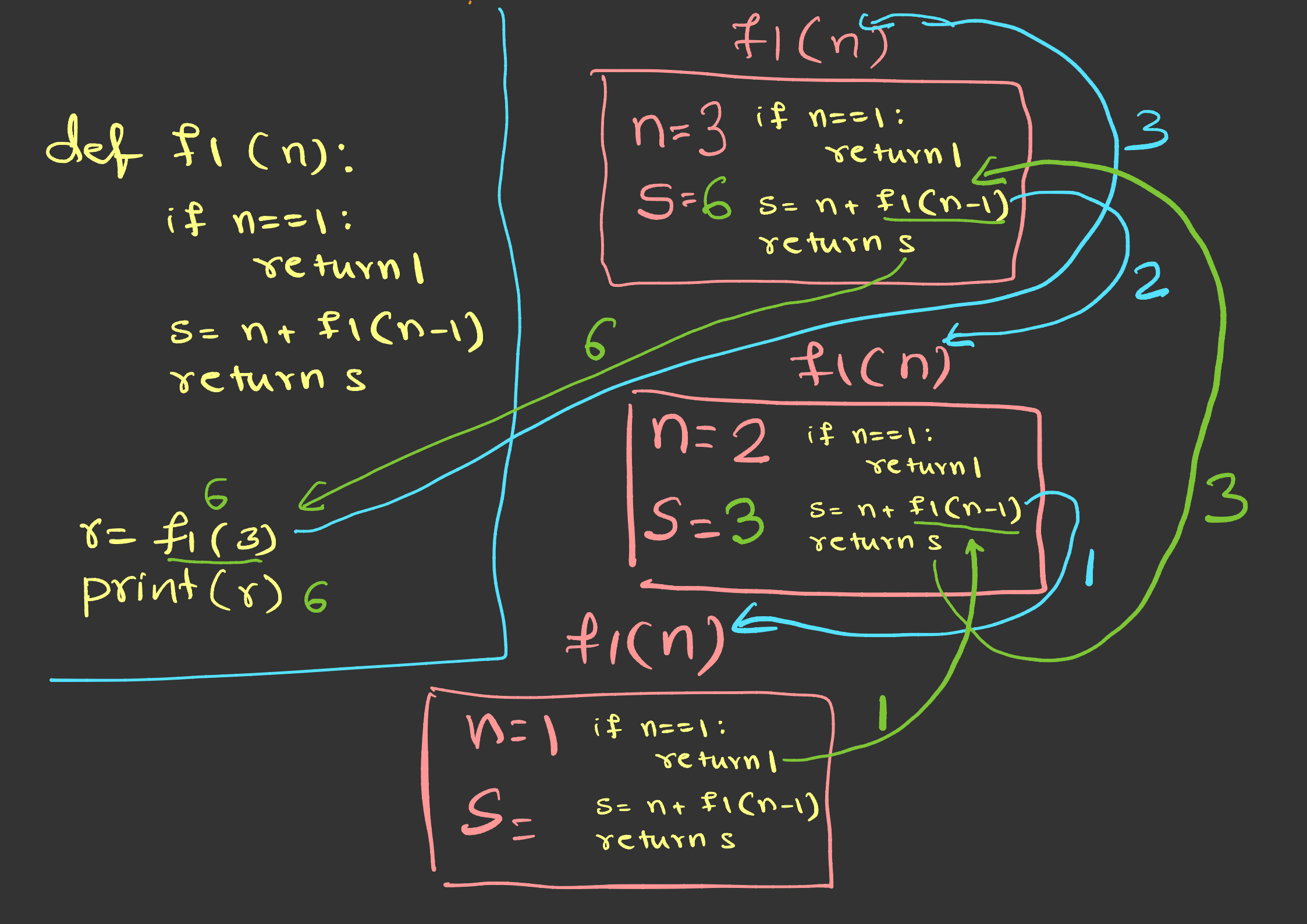
Agenda

1. What is recursion?
2. Recursion Tree
3. How to approach recursive solution?

Recursion

Function calling itself is called recursion.

```
def f1():
    ==
    f1()
    ==
```


def f1(n):
if n==1:
return 1
s= n+ f1(n-1)
return s
r= f1(3)
print(r)
6
f1(n)
n=3
s=6
if n==1:
return 1
s= n+ f1(n-1)
return s
f1(n)
n=2
s=3
if n==1:
return 1
s= n+ f1(n-1)
return s
f1(n)
n=1
s=
if n==1:
return 1
s= n+ f1(n-1)
return s
3
2
1
1
3
6
6

f1(5)	15	s = 5 + f1(4)	5+4+3+2+1
f1(4)	10	s = 4 + f1(3)	4+3+2+1
f1(3)	6	s = 3 + f1(2)	3+2+1
f1(2)	3	s = 2 + f1(1)	2+1
f1(1)	1	return 1	1

$$s = n + f1(n-1) \Rightarrow n+(n-1)+(n-2)+\ldots+4+3+2+1$$

n=100

100 + f1(99)

↓

99 + f1(98)

↓

98 + f1(97)

- In recursion, problem is solved in terms of problem itself
- Each time recursive function call to itself for little simpler version of the original problem

How to approach recursive function?

Write a recursive function to calculate sum of first n natural numbers.

① f1(n) 1+2+3+...+n

RC ② n+f1(n-1) 1+2+3+...+(n-1)

BC ③ n==1 1

```
def f1(n):
    if n==1:
        return 1
    return n+f1(n-1)
```

$$f_1(n) = \begin{cases} n + f1(n-1) & n > 1 \\ 1 & n == 1 \end{cases}$$