61A Lecture 22

Friday, October 25

Announcements

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- No lab next Monday, Tuesday, & Wednesday
- Homework 7 is due Tuesday 11/5 @ 11:59pm (Two weeks)

Mutable Recursive Lists

Recursive Lists Can Change

Attribute assignment statements can change first and rest attributes of an Rlist.

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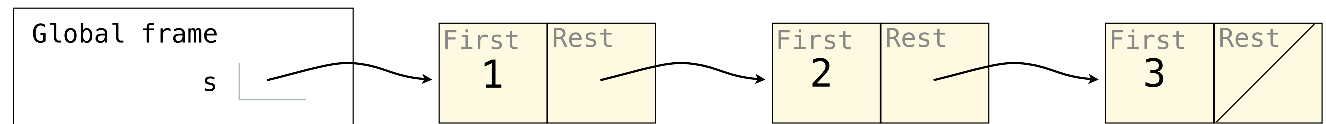

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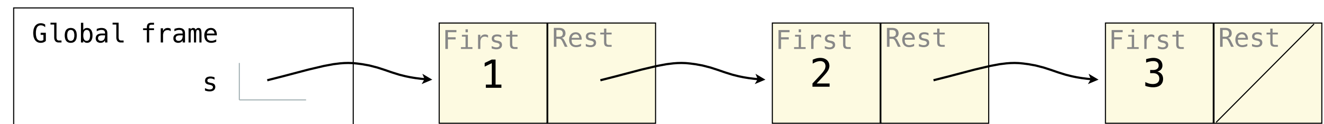

Note: The actual environment diagram is much more complicated.

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>>> t.rest = s
>>> s.first
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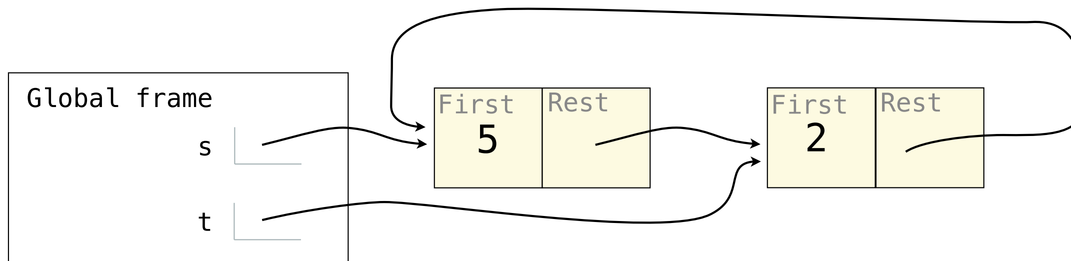

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Recursive Lists as Functions

Mutable Recursive Lists Using Functions

The object system is convenient, but it isn't necessary for designing data types!

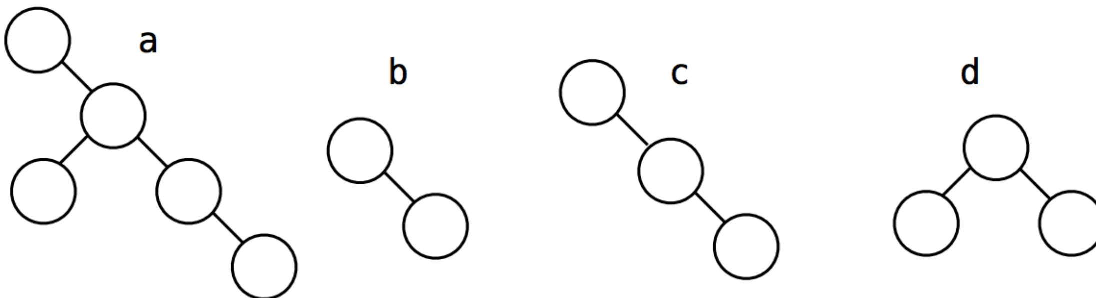
(Demo)

Trees

Pruned Trees

Consider the binary **Tree** class below, which has no entry attribute.

```
class Tree(object):
    """A binary tree with no entries."""
    def __init__(self, left=None, right=None):
        self.left = left
        self.right = right
a = Tree(None, Tree(Tree(), Tree(None, Tree())))
b = Tree(None, Tree())
c = Tree(None, Tree(None, Tree()))
d = Tree(Tree(),  Tree())
```



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pruned	True	True	False

Pruned Trees

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b = Tree(None, Tree())
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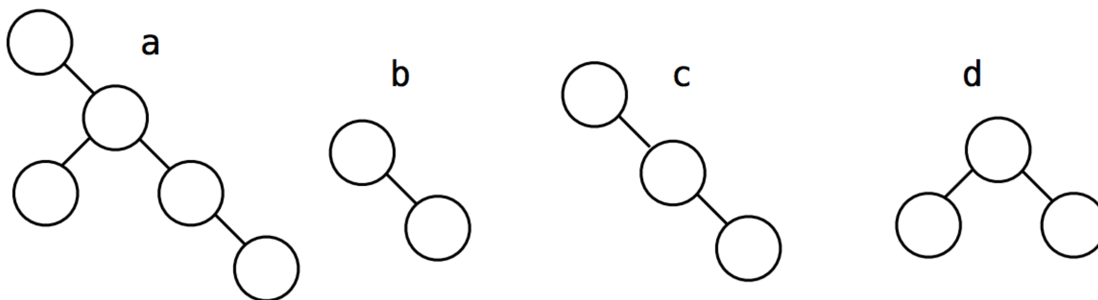
d = Tree(Tree(),  Tree())
```

Write a function **pruned** that takes two **Tree** arguments **t1** and **t2** and returns whether **t2** is a pruned version of **t1**. **t2** is a pruned version of **t1** if all paths from the root of **t2** are also valid paths from the root of **t1**.



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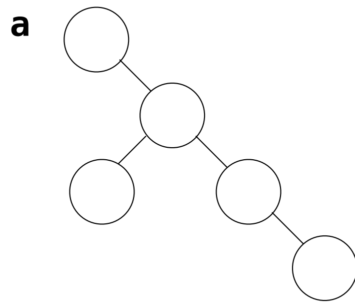
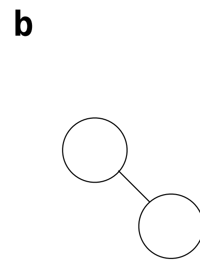
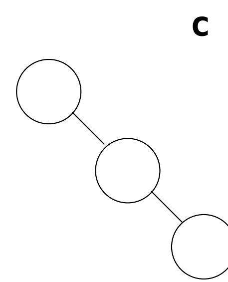
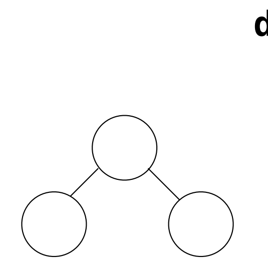
Pruned Tree Examples









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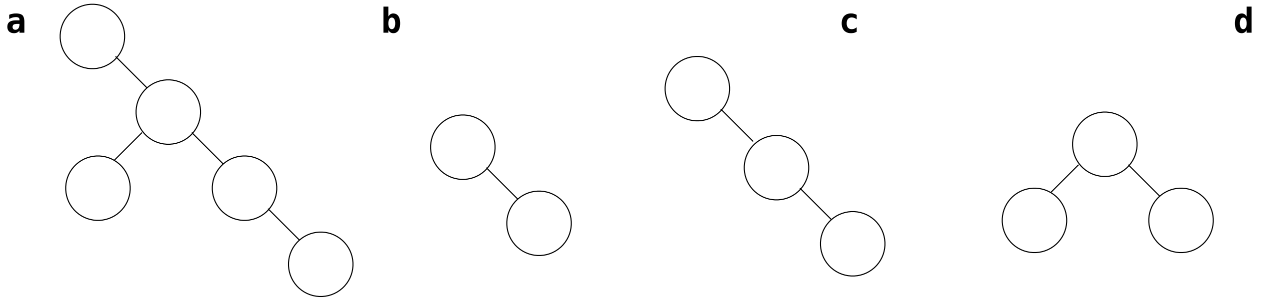

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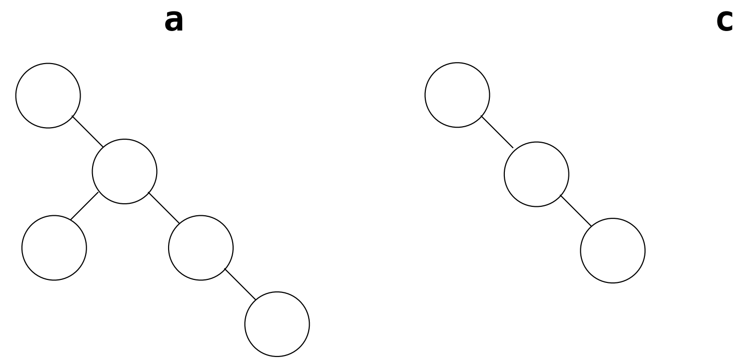
Recursive Idea



Recursive Idea

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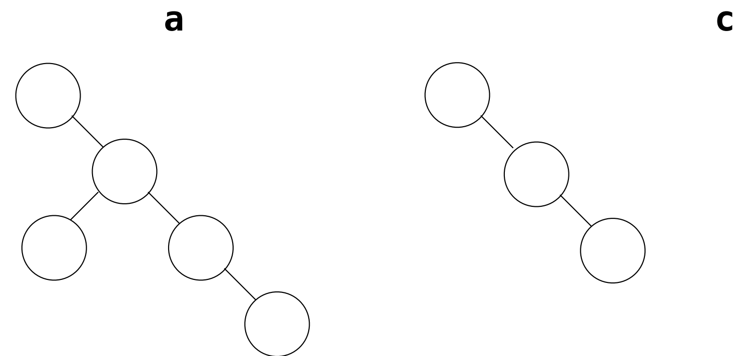

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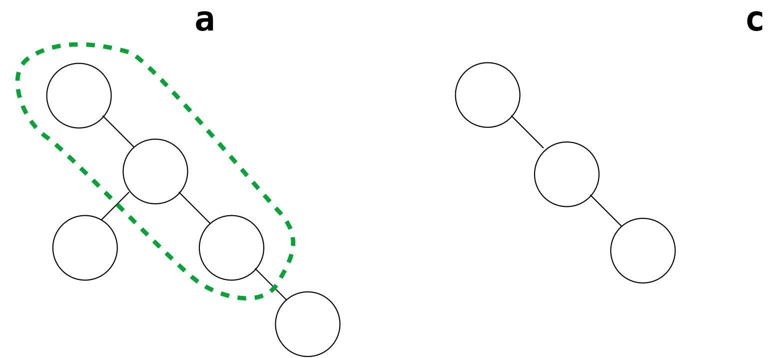

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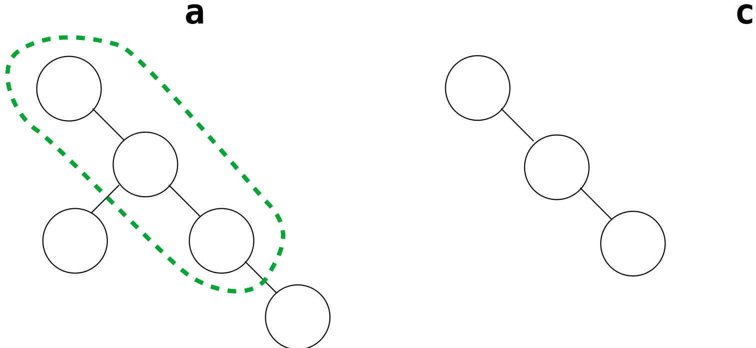

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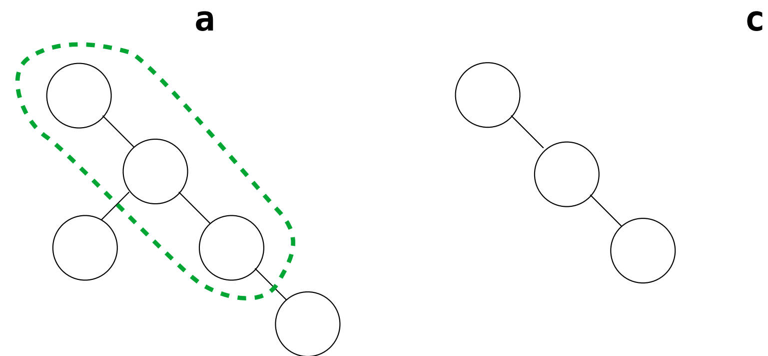

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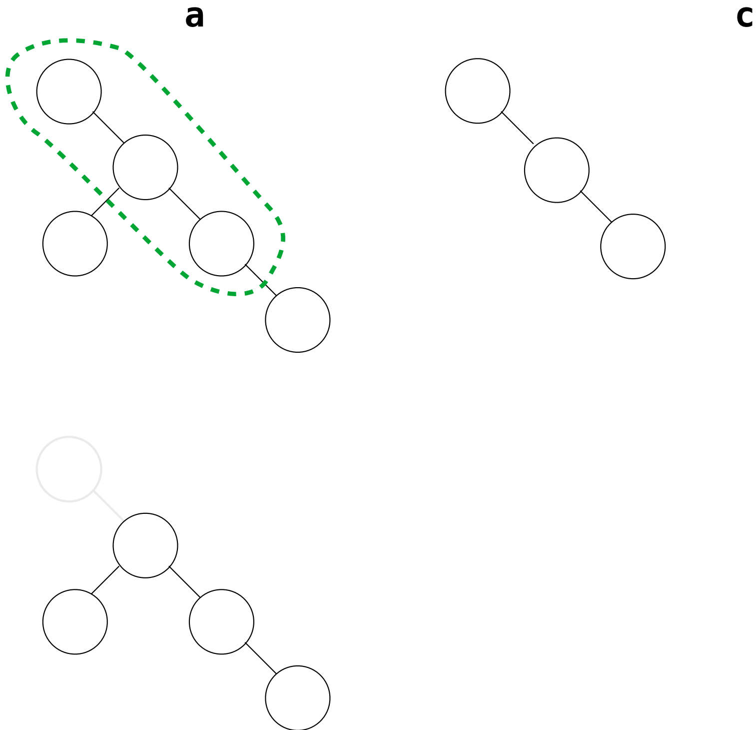

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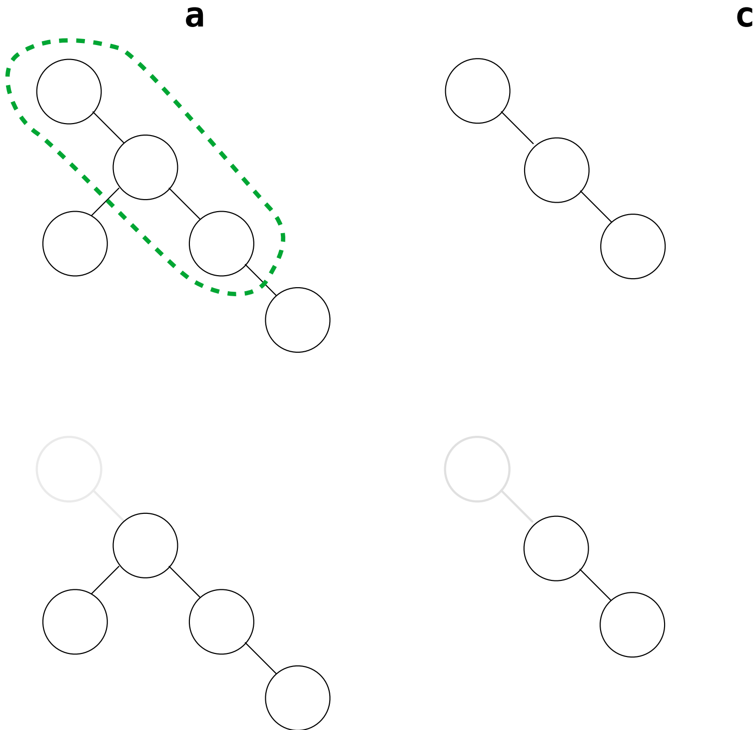

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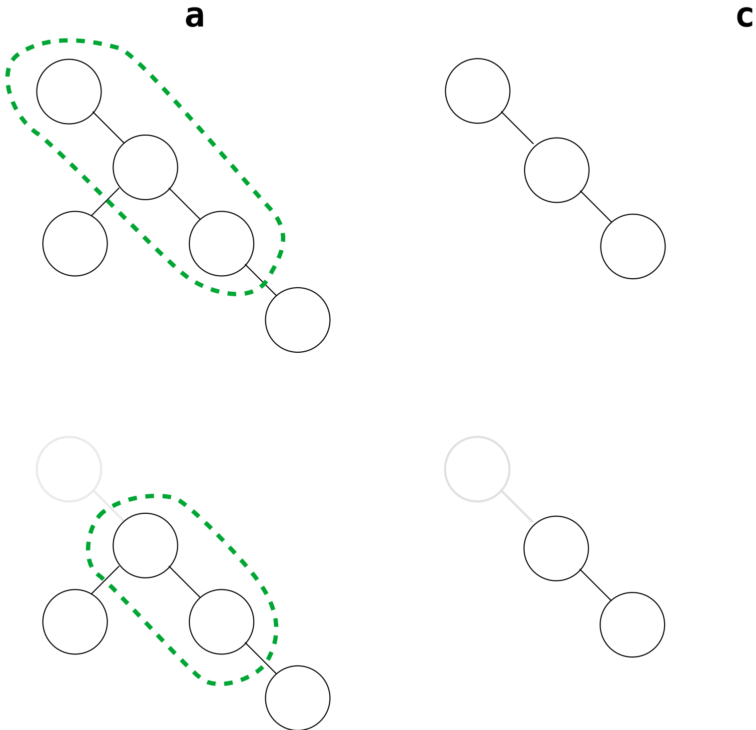

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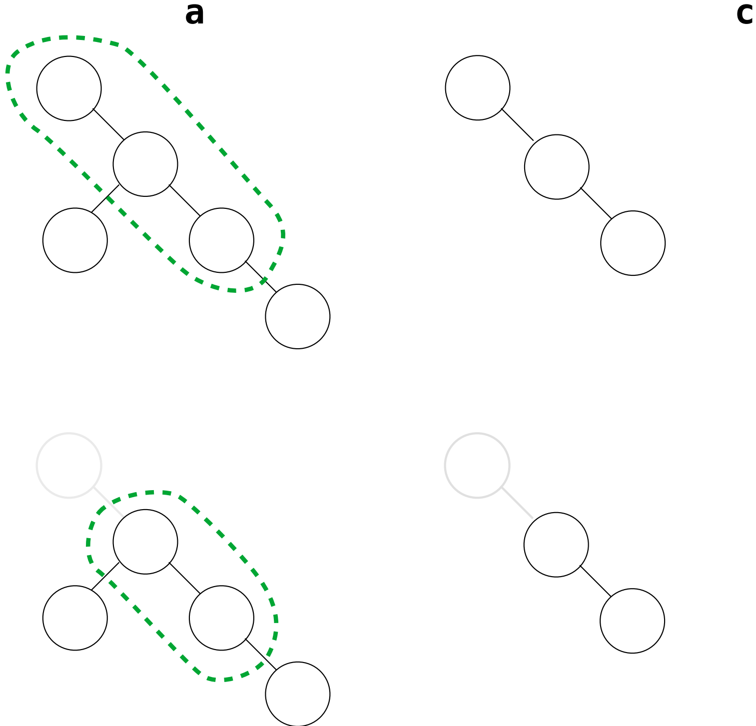

what about c.left?

Recursive Idea

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`implies`

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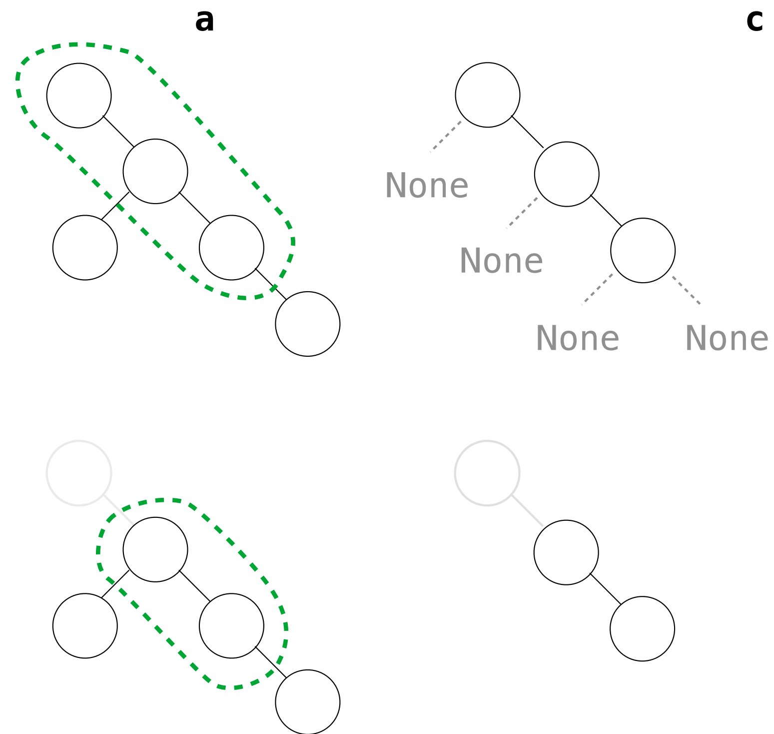

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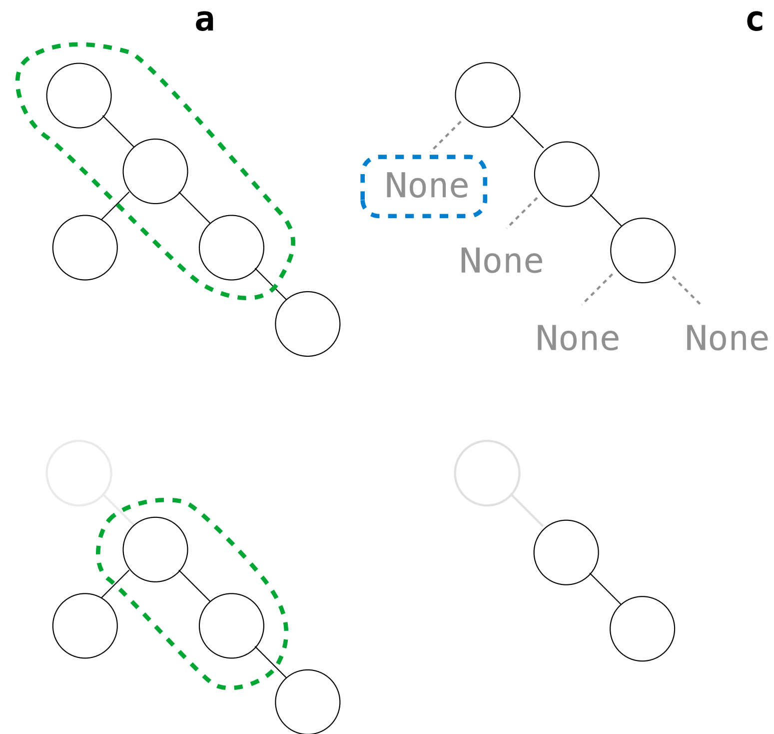


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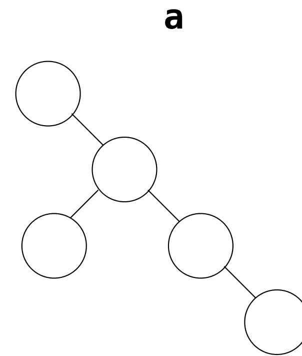
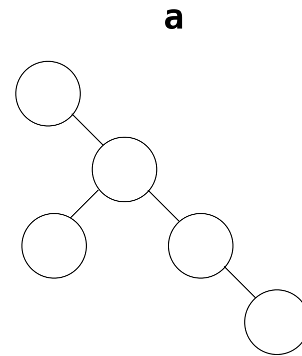


Recursive Idea

`pruned(a, d)`



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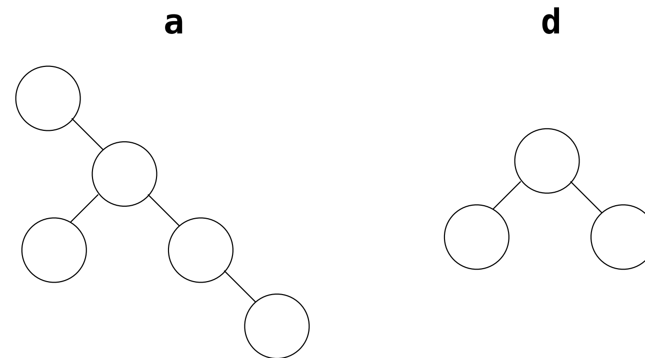

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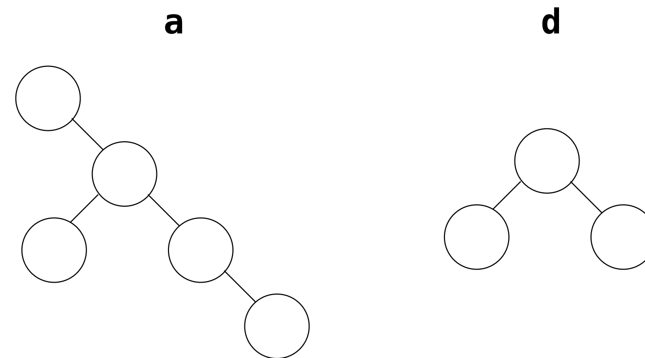

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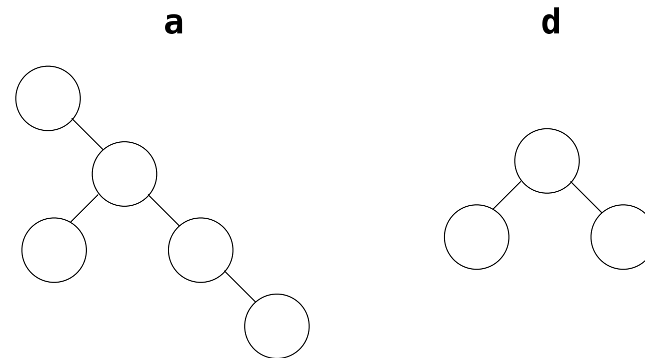

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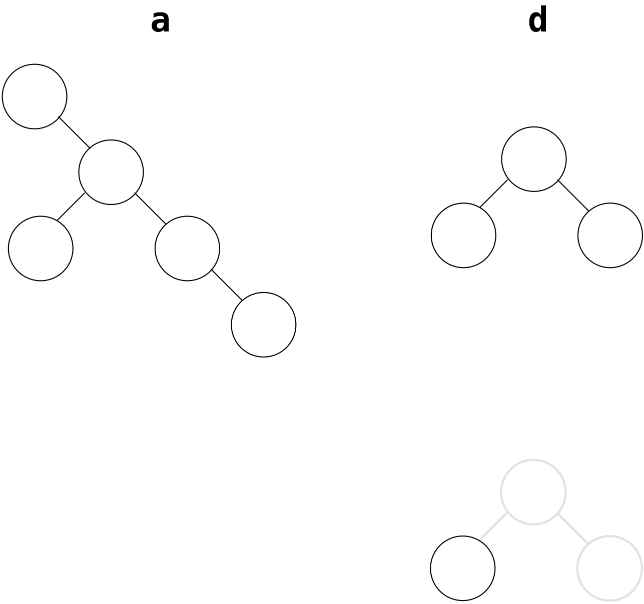

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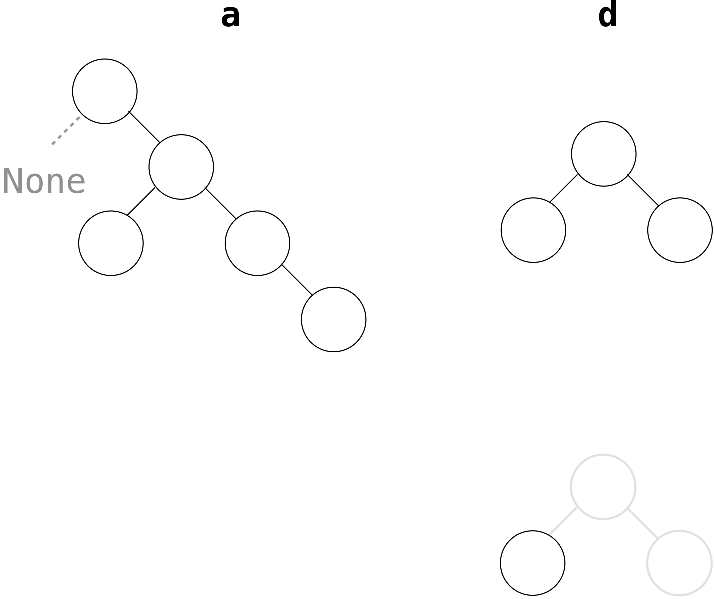

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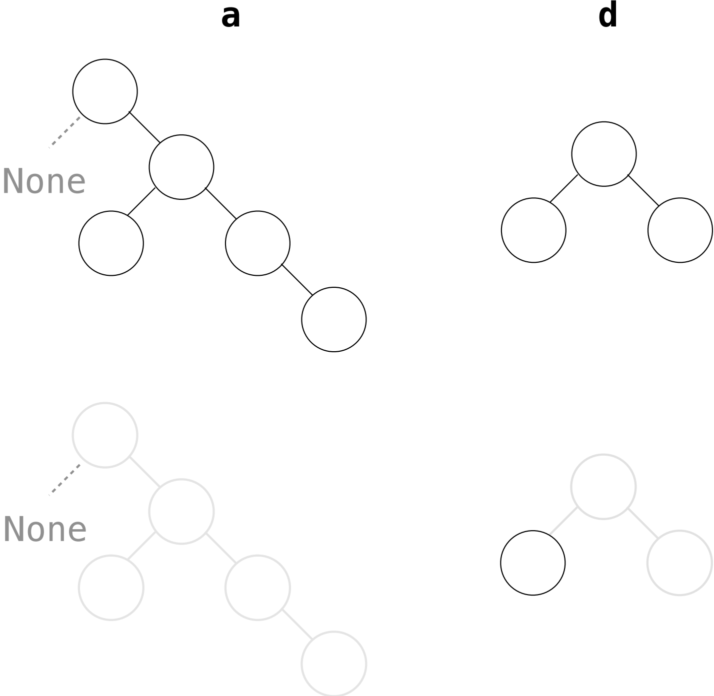

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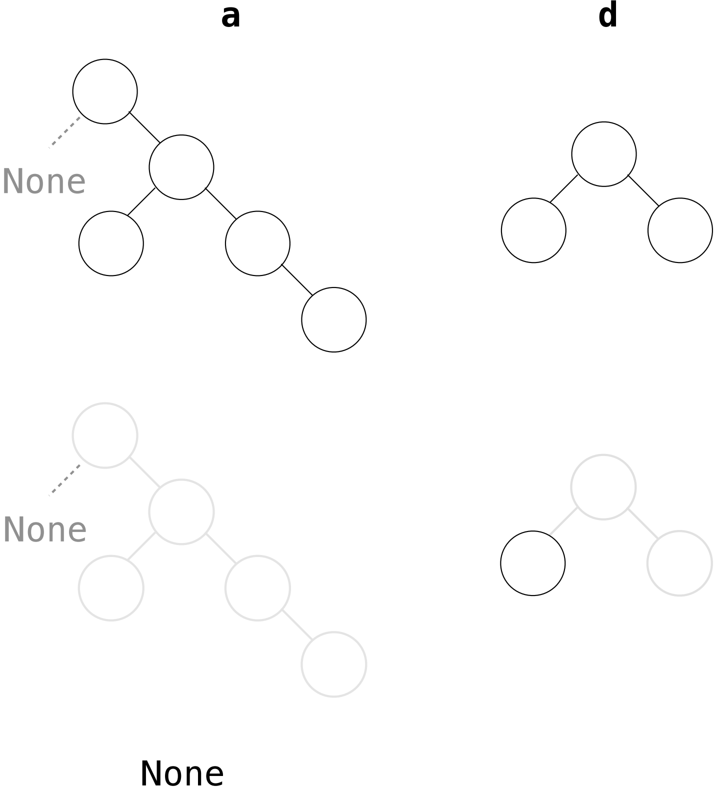

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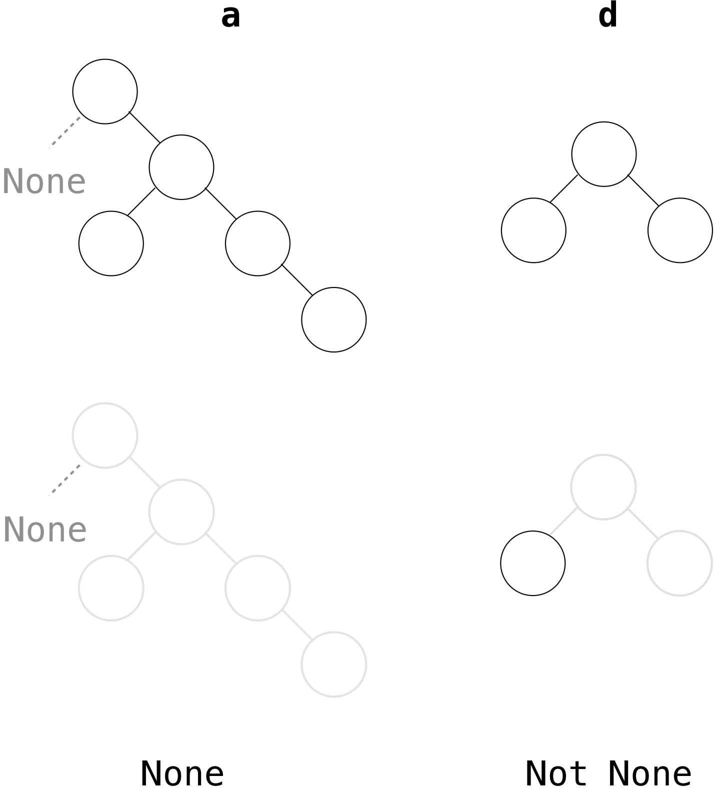
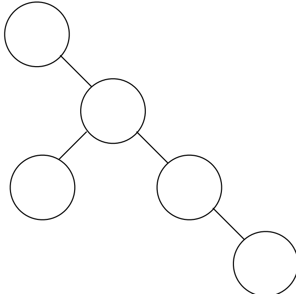
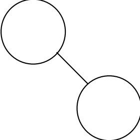


Recursive Implementation

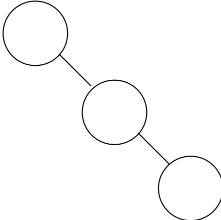
a



b



c



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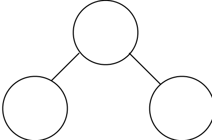

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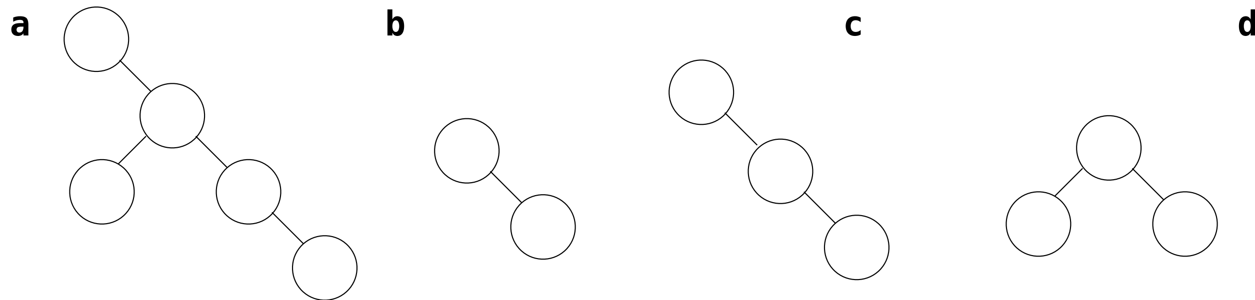
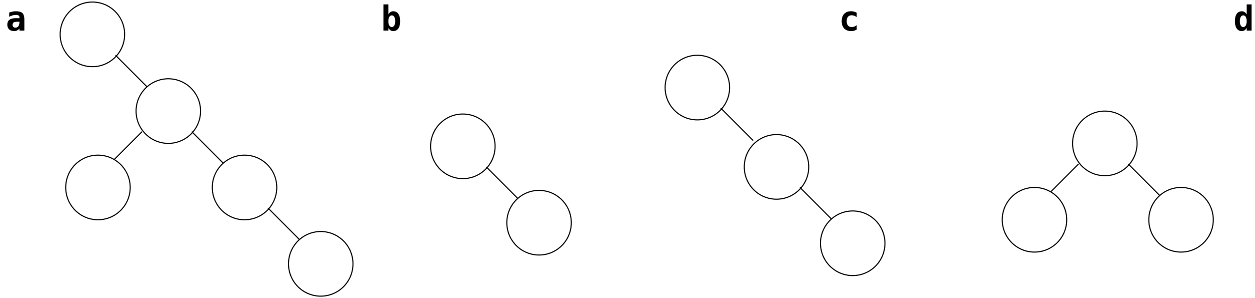


Recursive call: Both the left and right are pruned, respectively

Recursive Implementation



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Base cases: one (or more) of the trees is None

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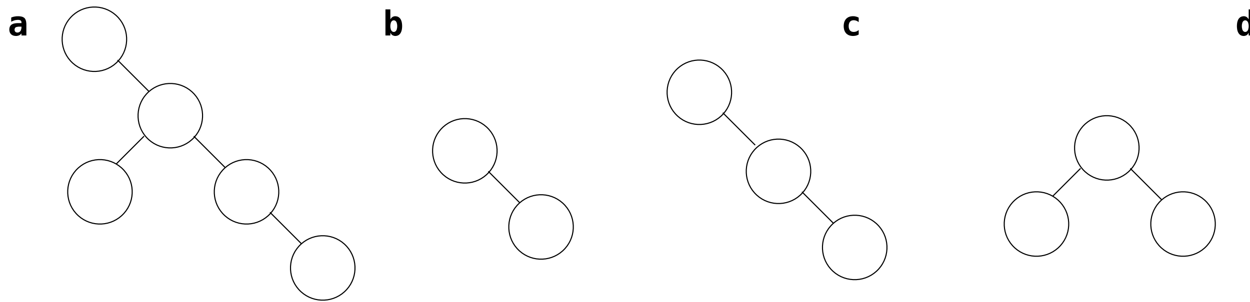

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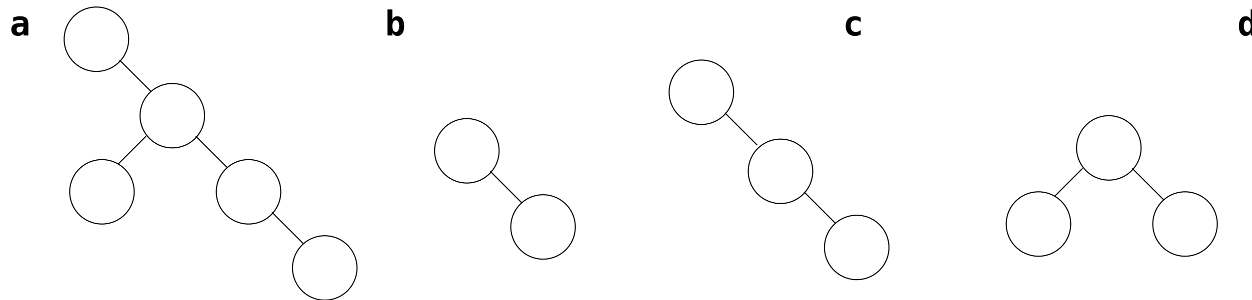
```
def pruned(t1, t2):
```

Recursive Implementation

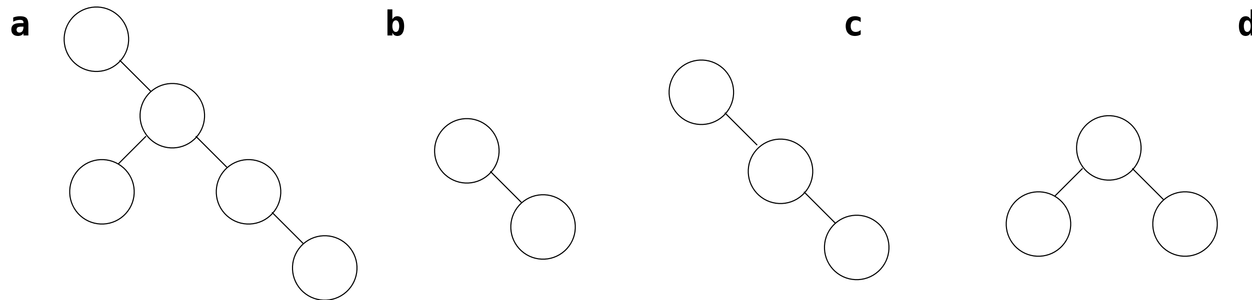


Recursive call: Both the left and right are pruned, respectively

Base cases: one (or more) of the trees is None

```
def pruned(t1, t2):
    if t2 is None:
```

Recursive Implementation

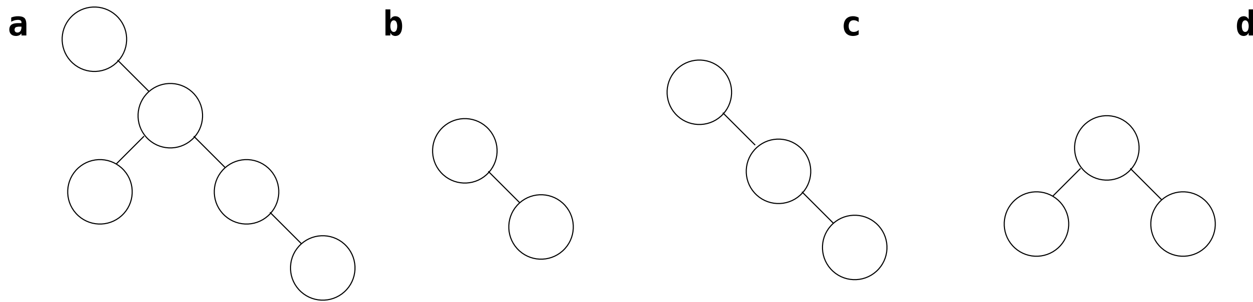


Recursive call: Both the left and right are pruned, respectively

Base cases: one (or more) of the trees is None

```
def pruned(t1, t2):
    if t2 is None:
        return True
```

Recursive Implementation

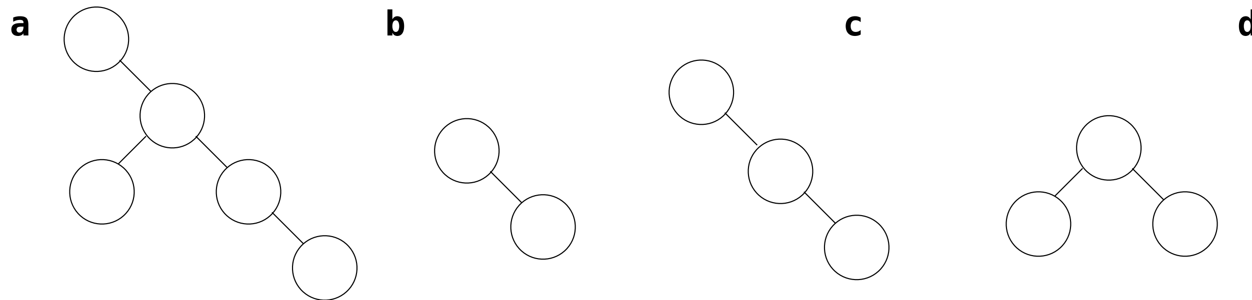


Recursive call: Both the left and right are pruned, respectively

Base cases: one (or more) of the trees is None

```
def pruned(t1, t2):
    if t2 is None:
        return True
    elif t1 is None:
```

Recursive Implementation



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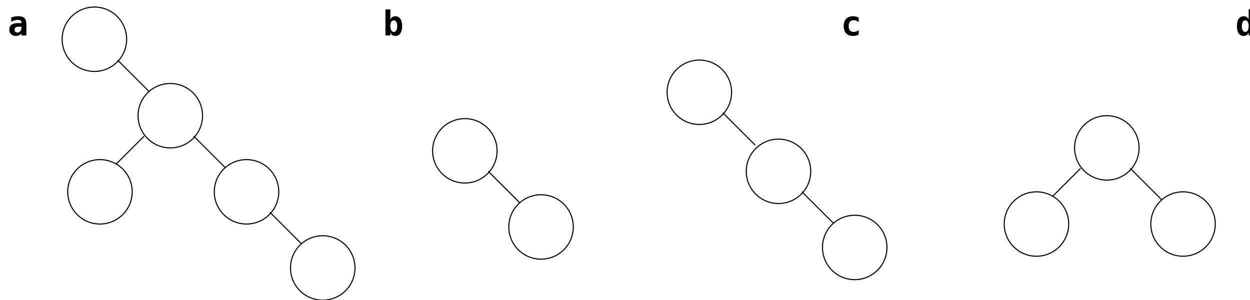
Recursive Implementation



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Base cases: one (or more) of the trees is None

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def pruned(t1, t2):
    if t2 is None:
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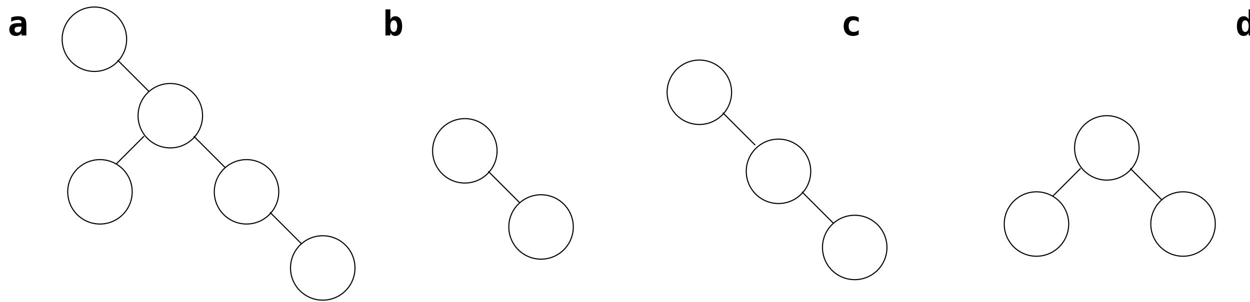
Recursive Implementation



Recursive call: Both the left and right are pruned, respectively

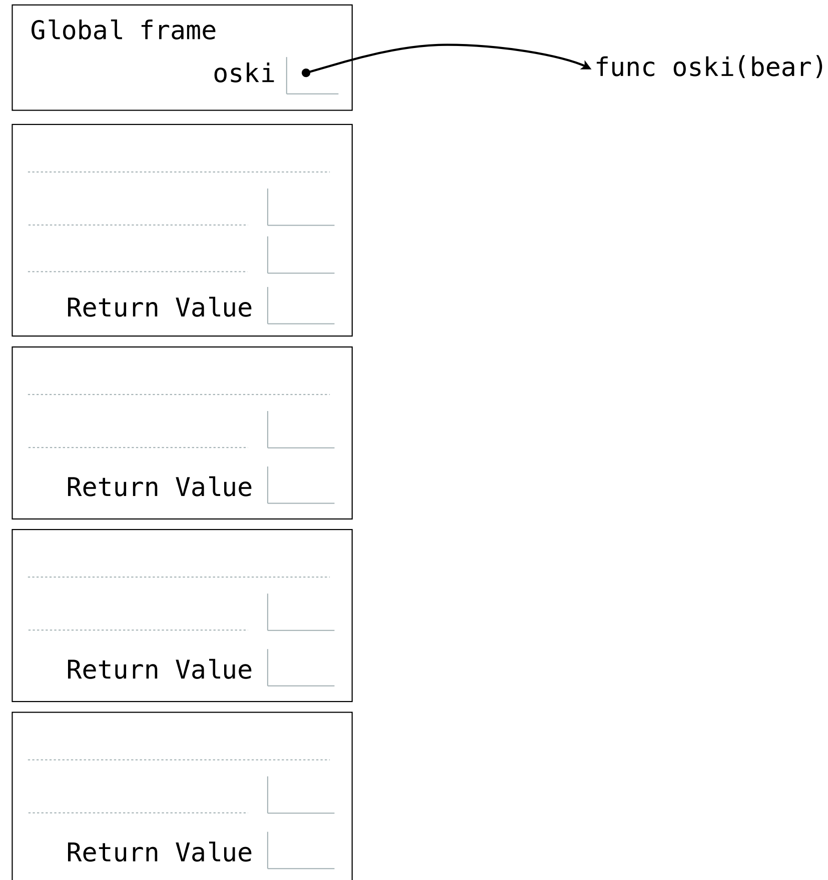
Base cases: one (or more) of the trees is None

```
def pruned(t1, t2):
    if t2 is None:
        return True
    elif t1 is None:
        return False
    else:
        return pruned(t1.left, t2.left) and pruned(t1.right, t2.right)
```

Non-Local Assignment

Go Bears!

```
def oski(bear):
    def cal(berk):
        nonlocal bear
        if bear(berk) == 0:
            return (berk+1, berk-1)
        bear = lambda ley: berk-ley
        return (berk, cal(berk))
    return cal(2)
oski(abs)
```



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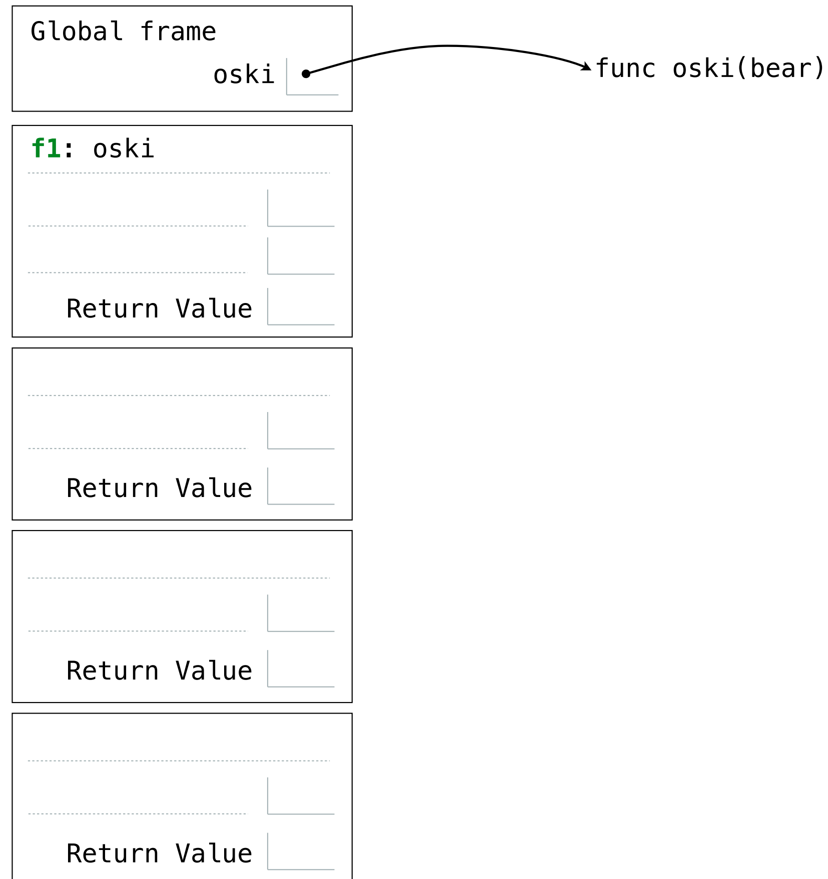

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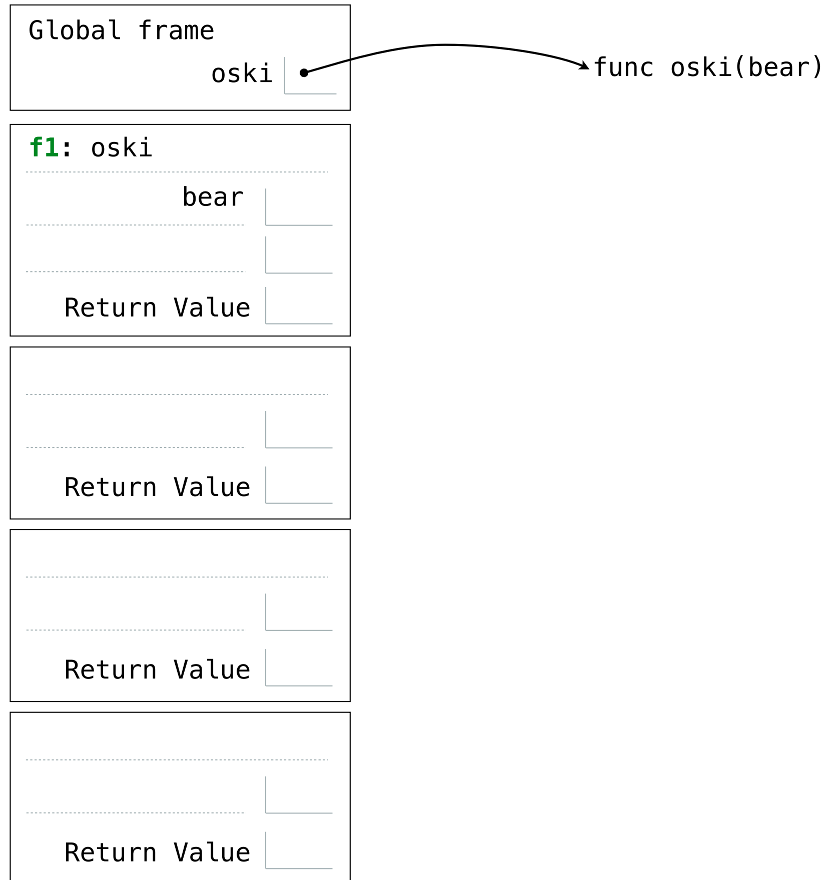

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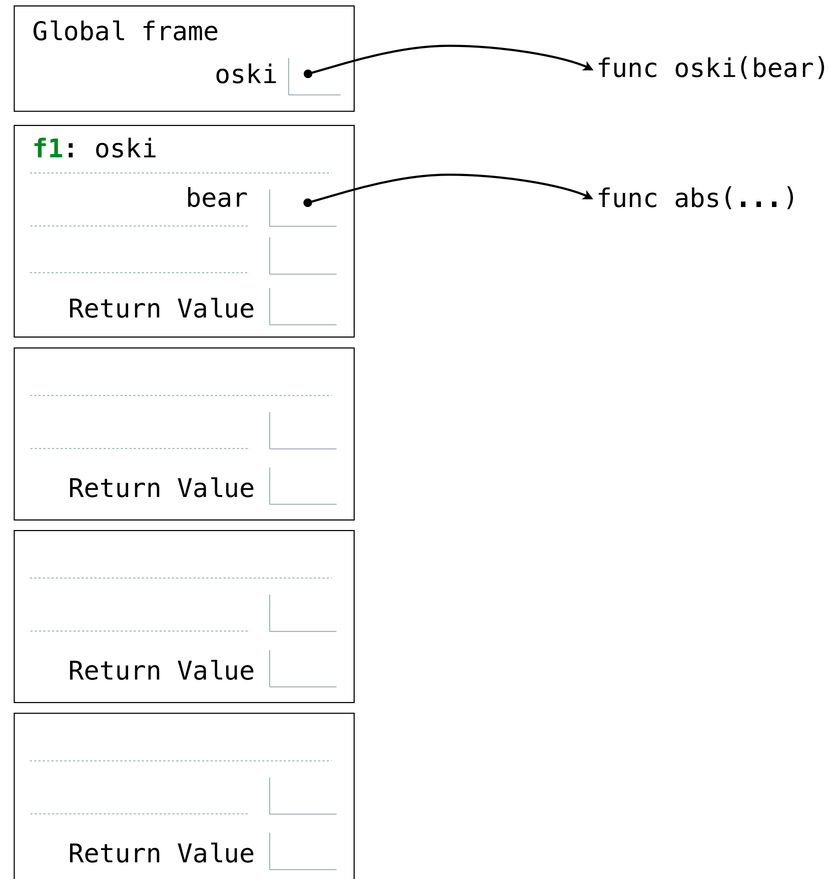

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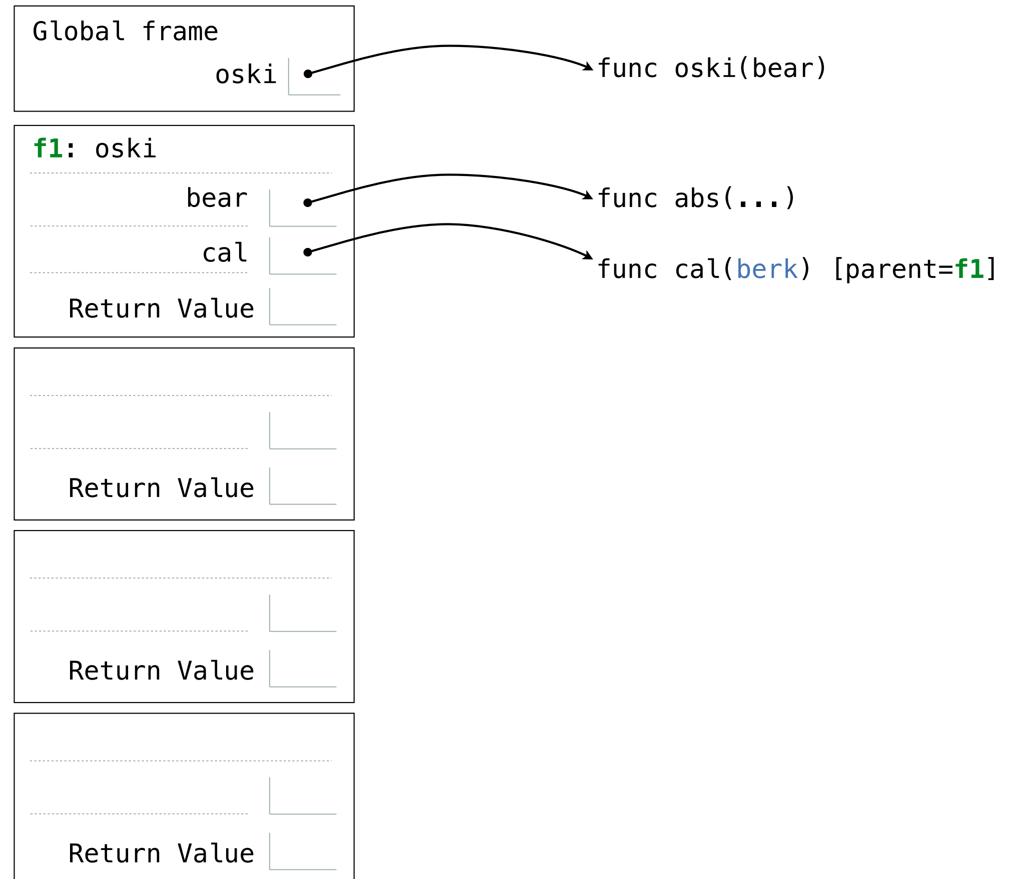

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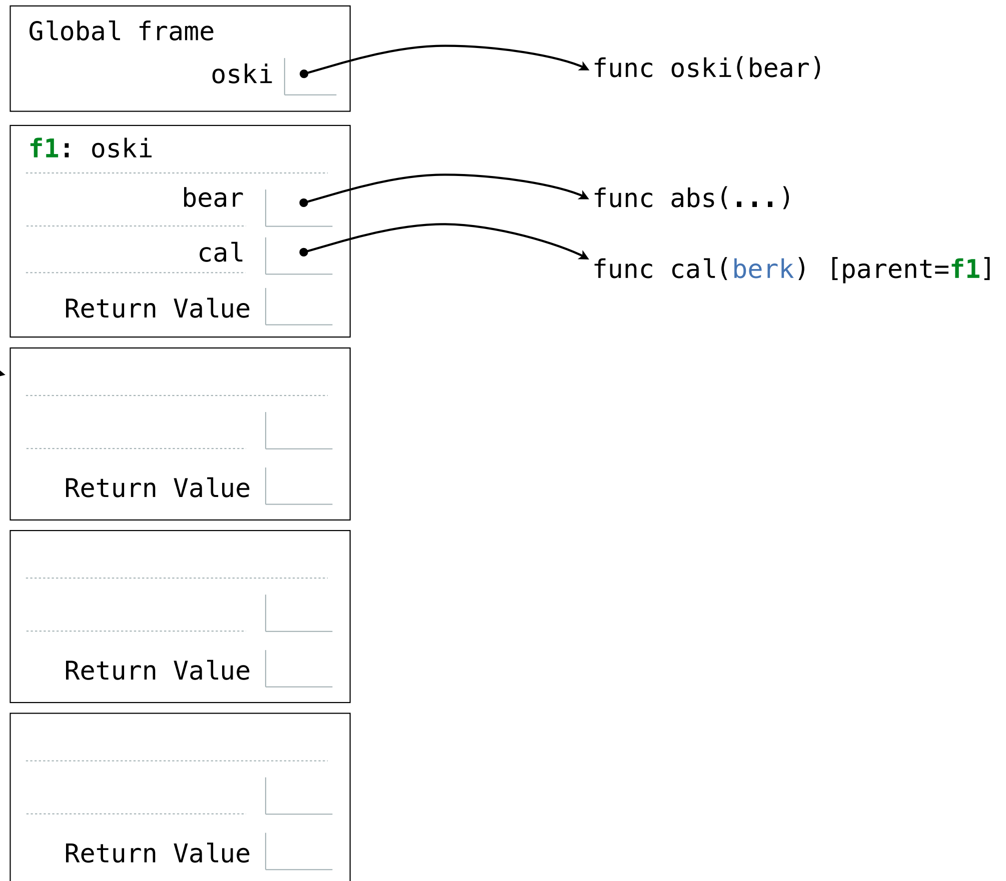

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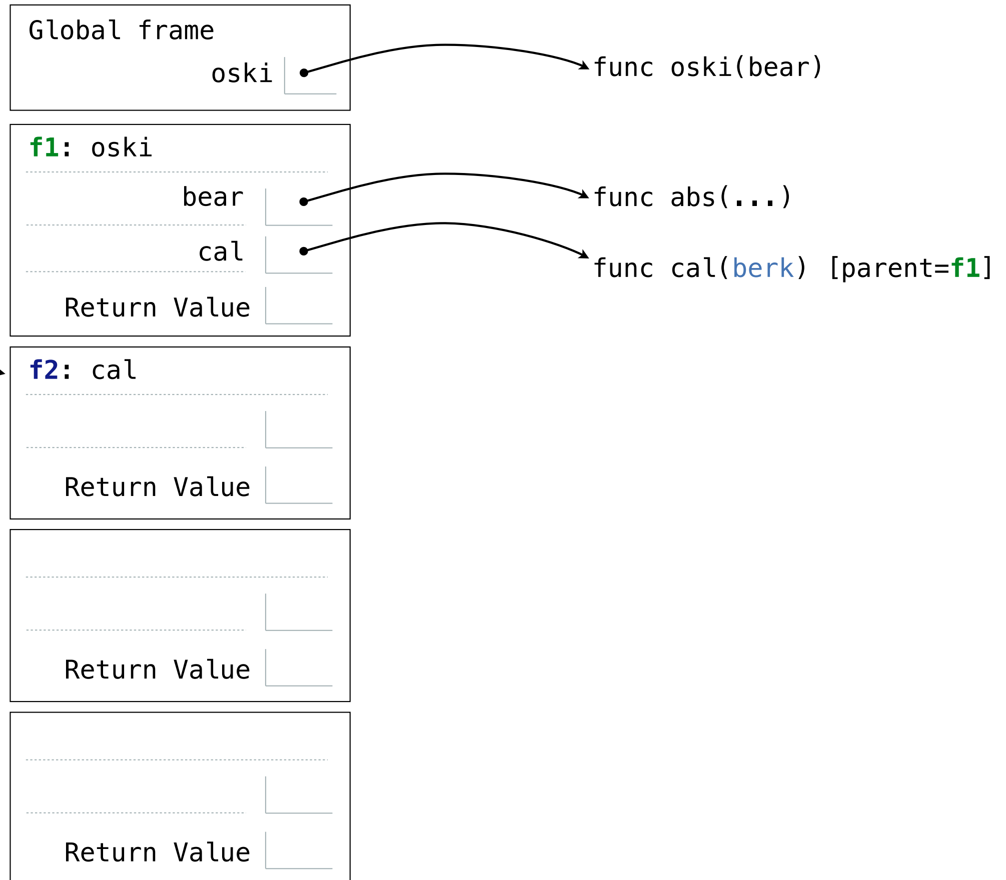

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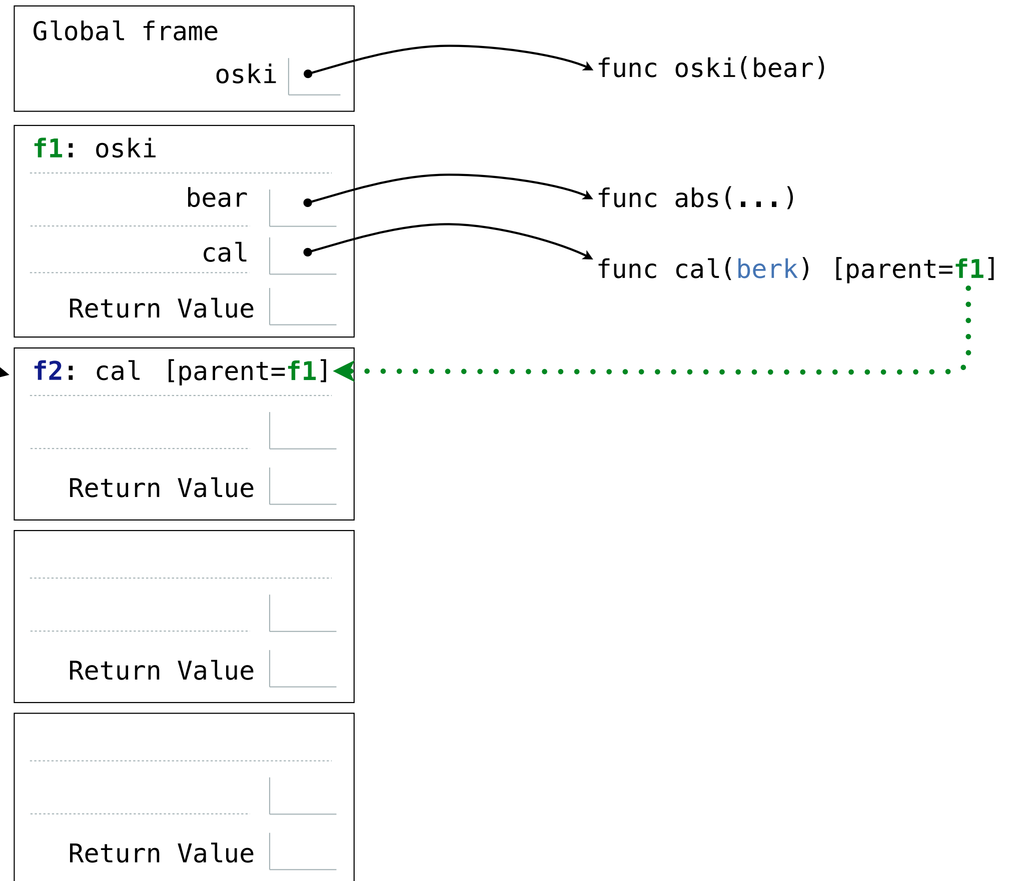

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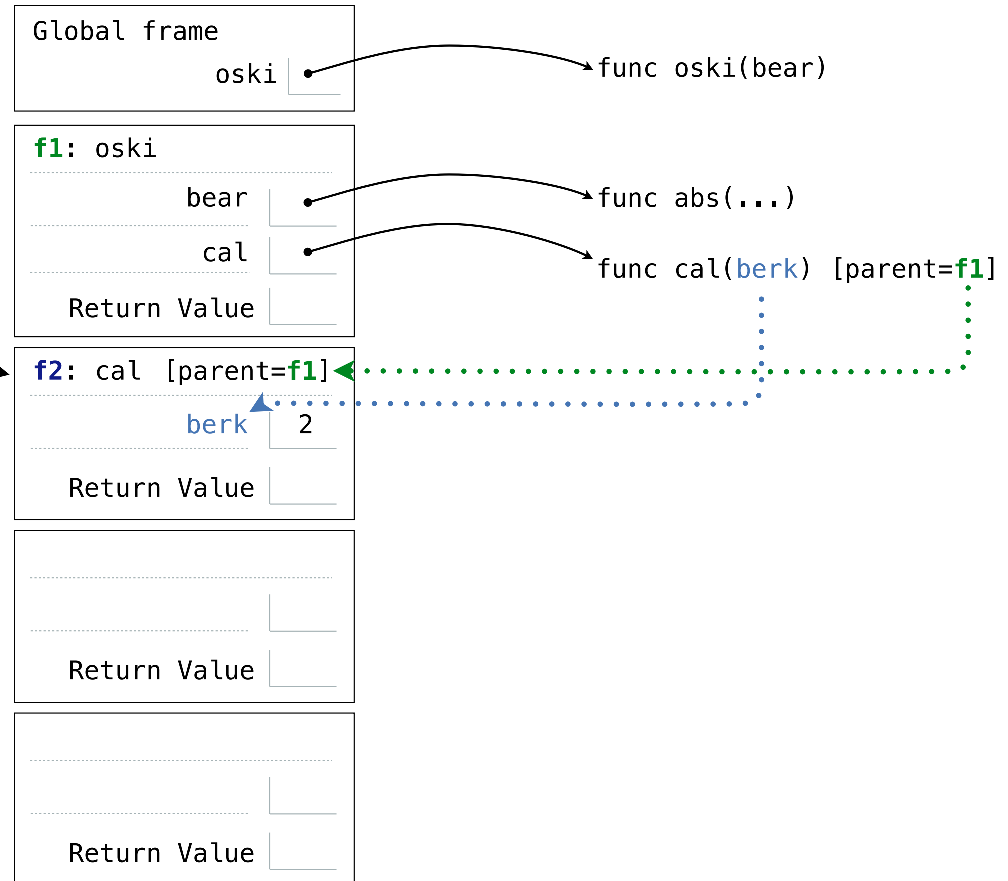

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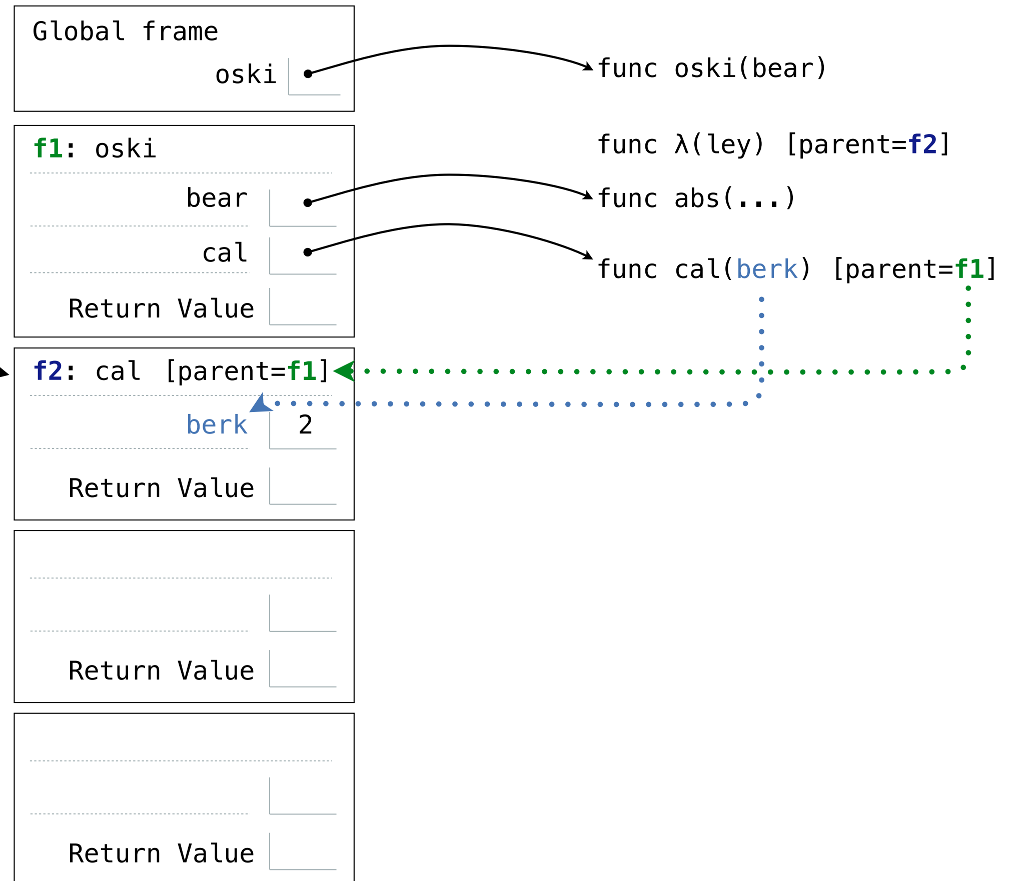

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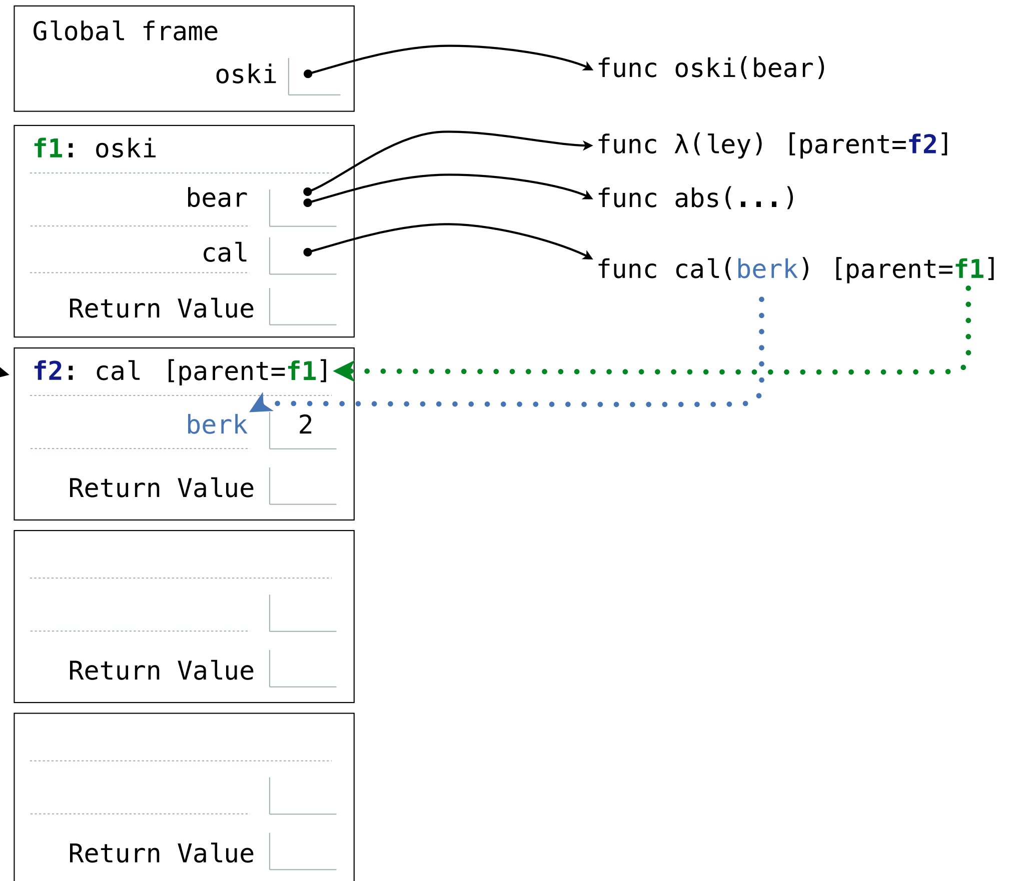

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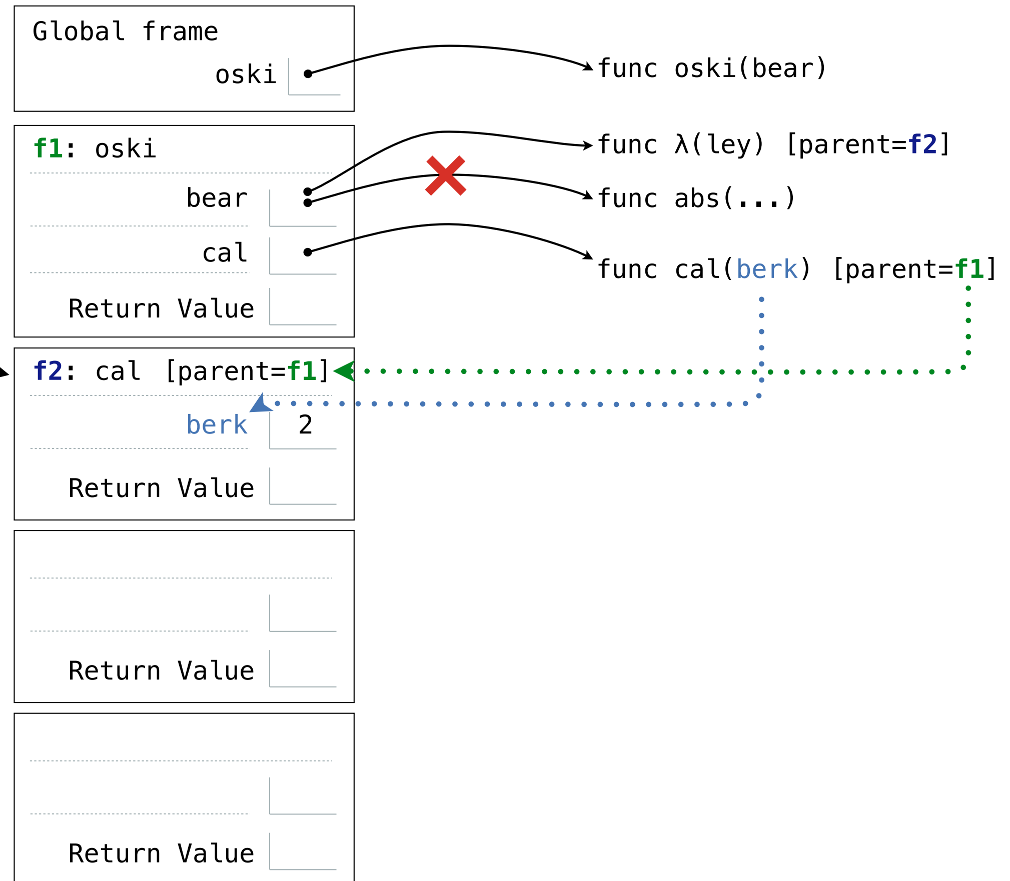

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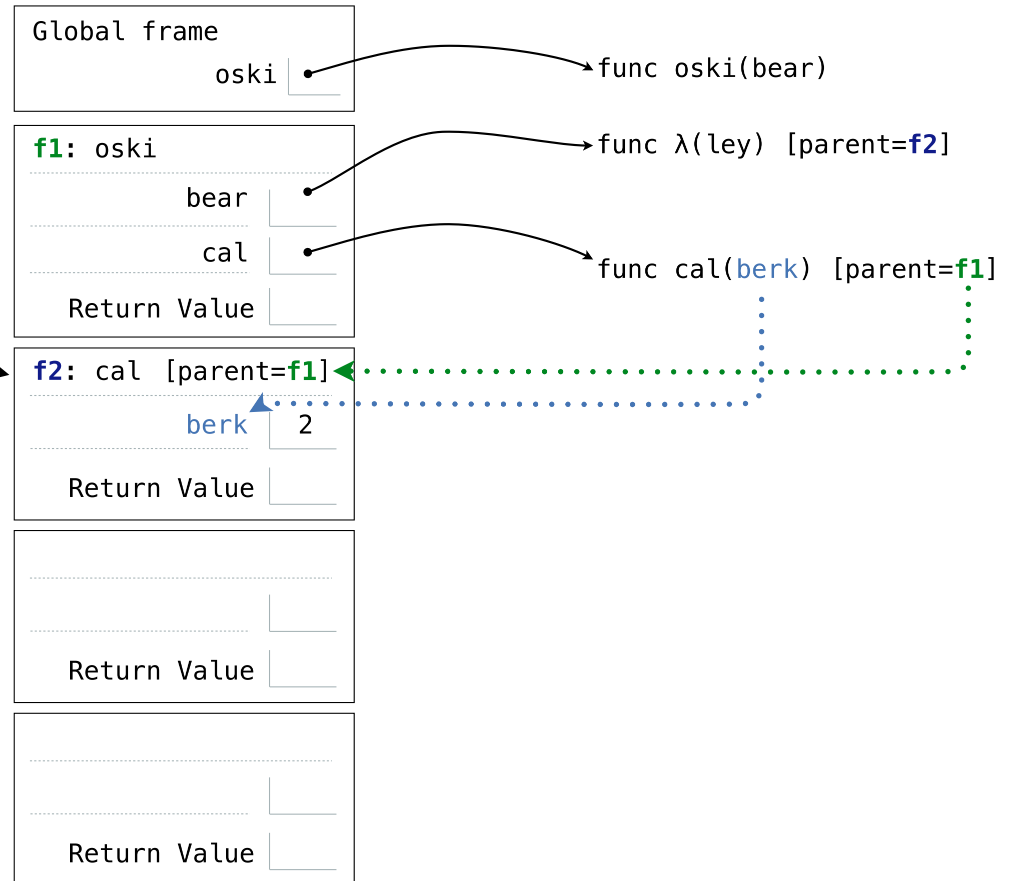

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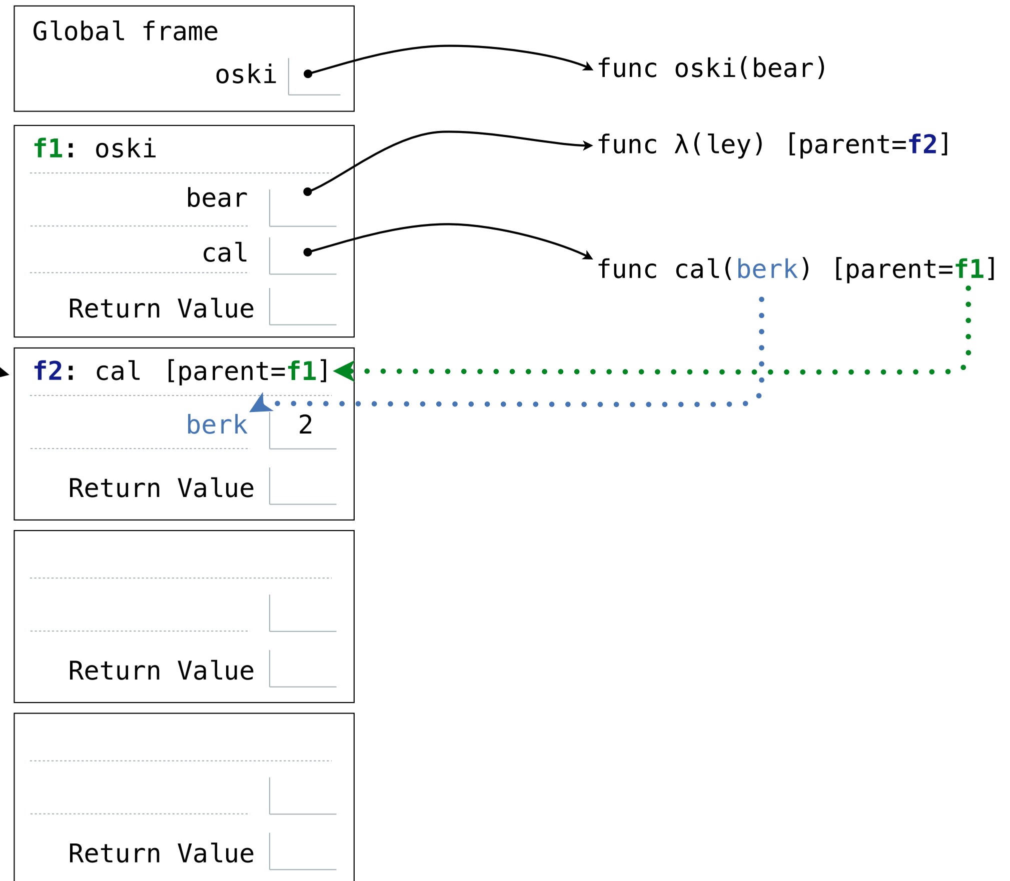

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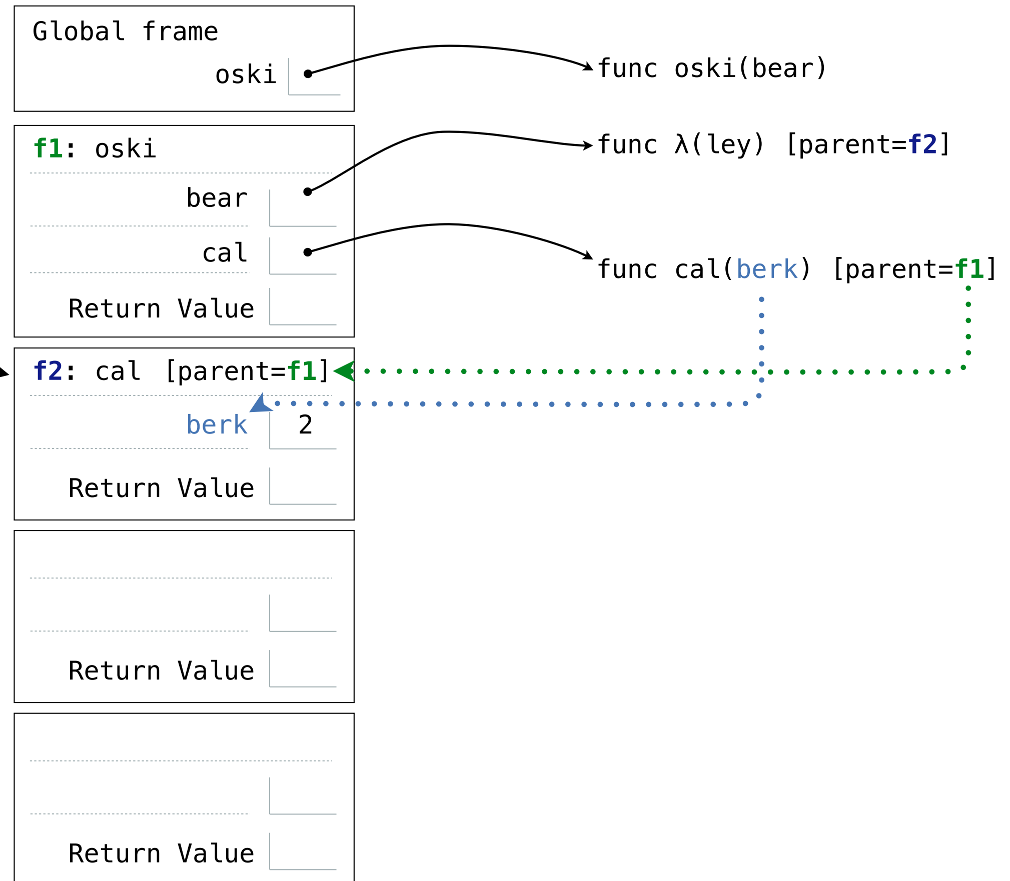

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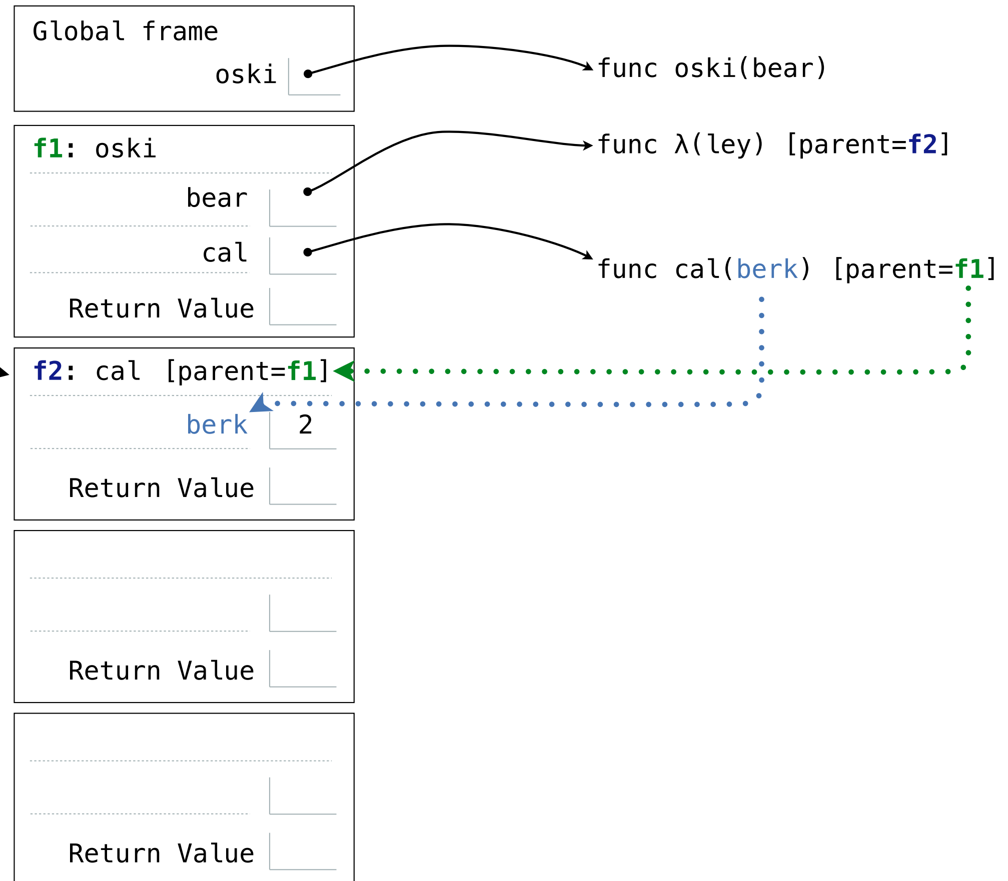

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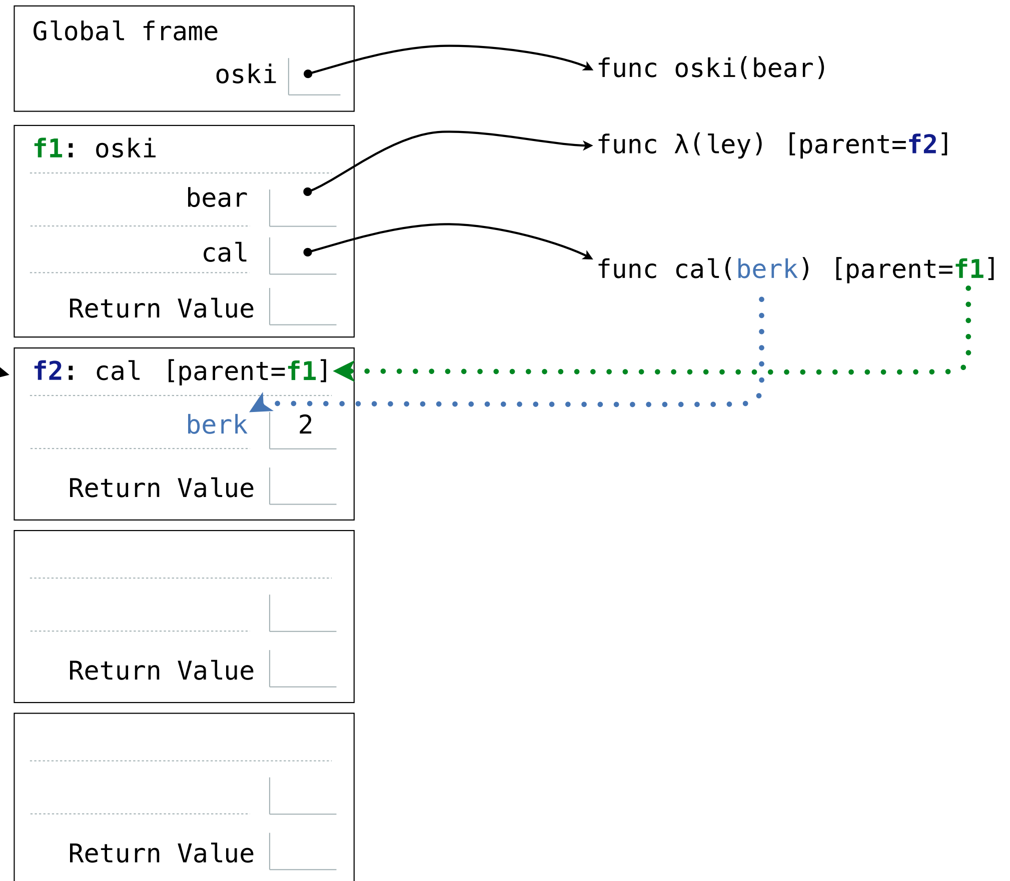

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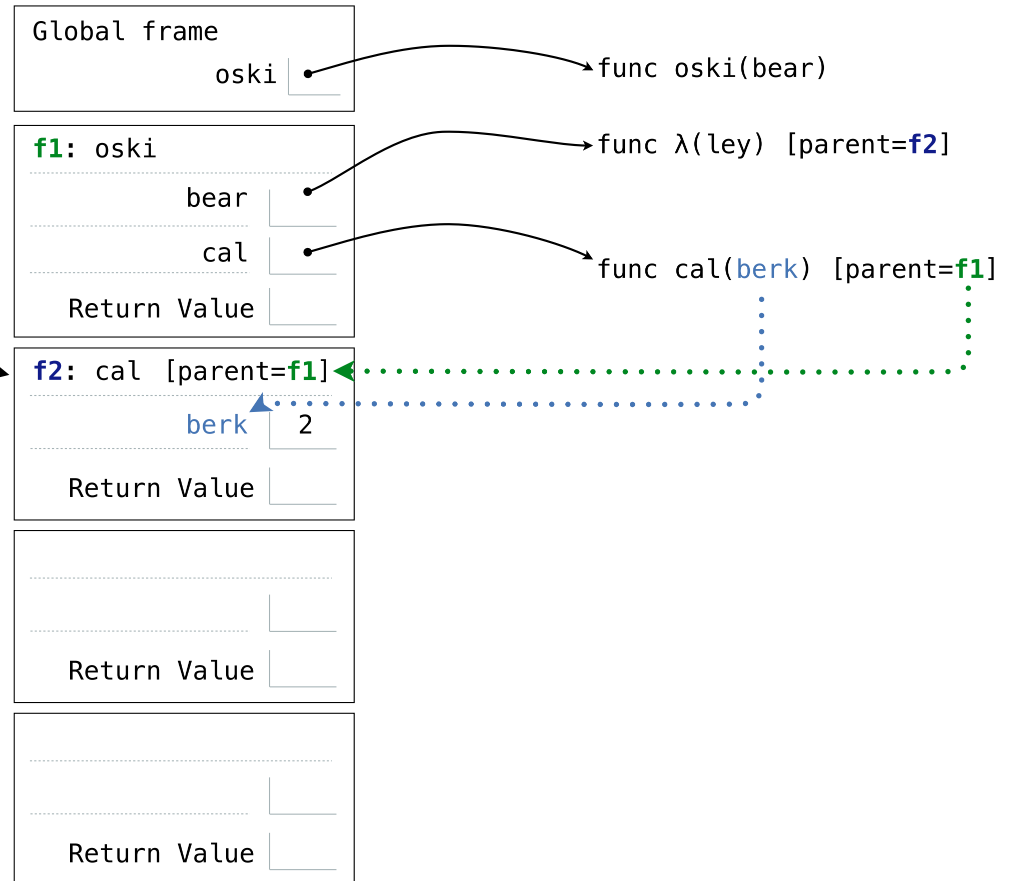

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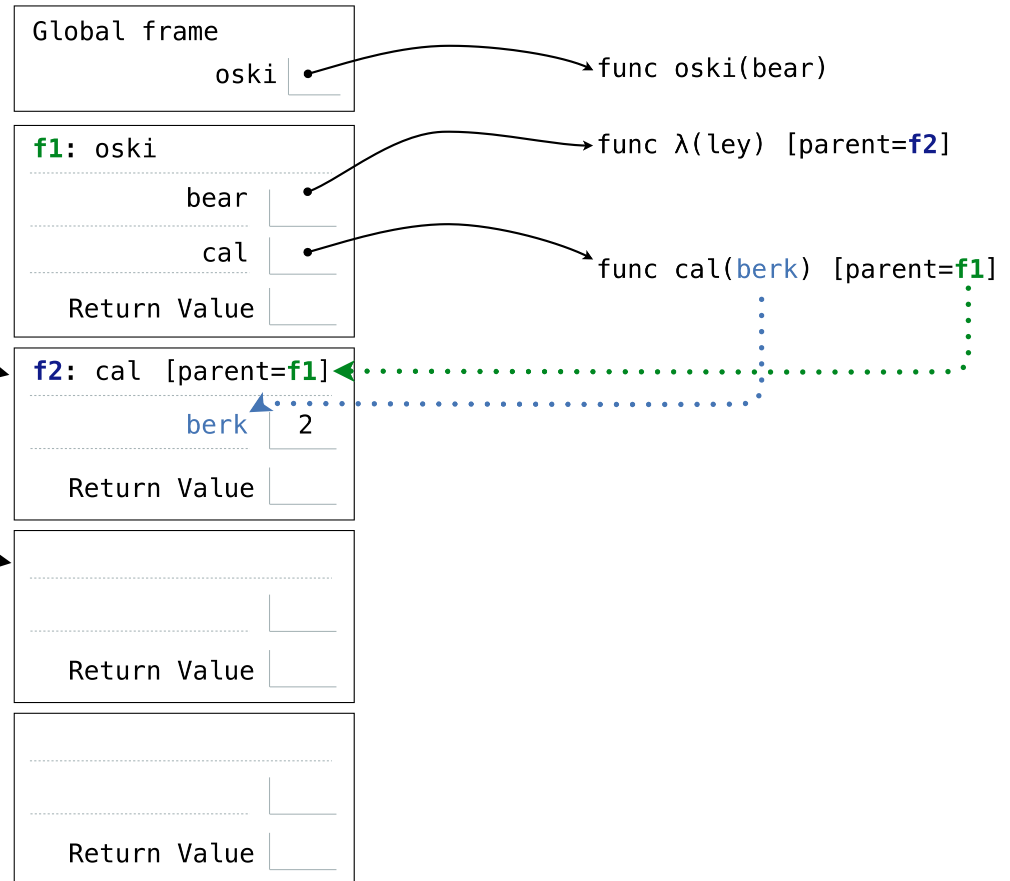

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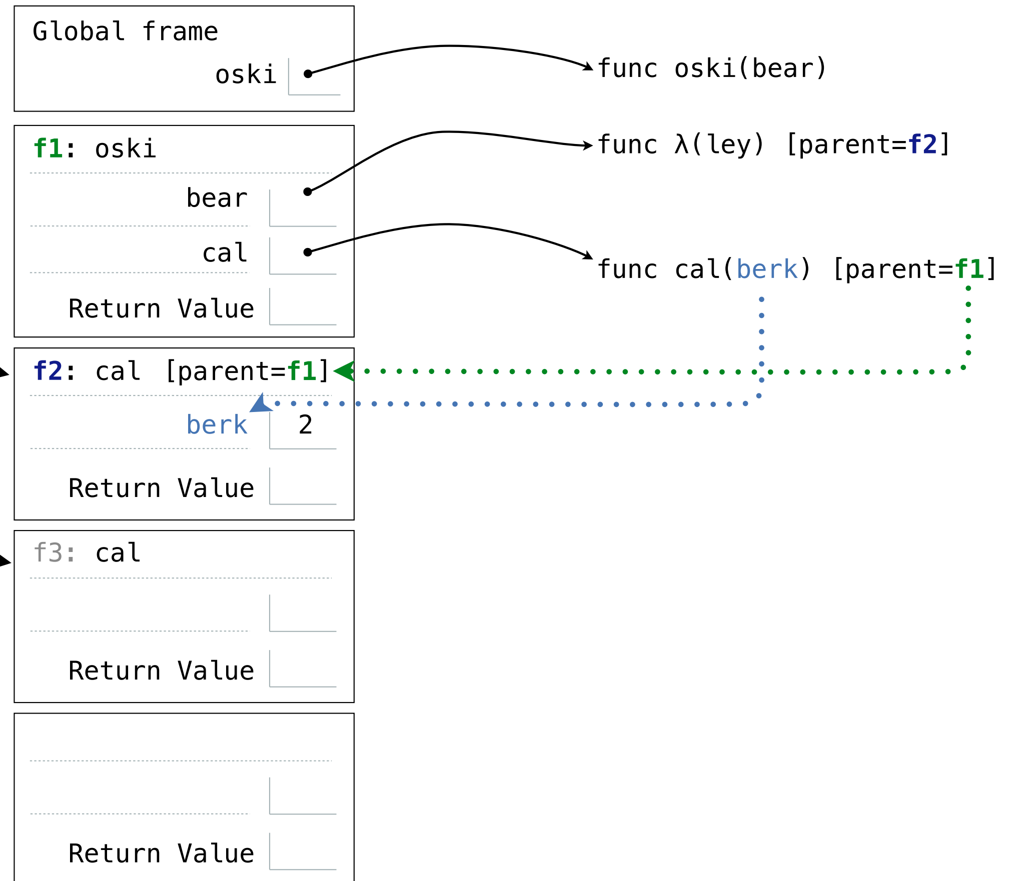

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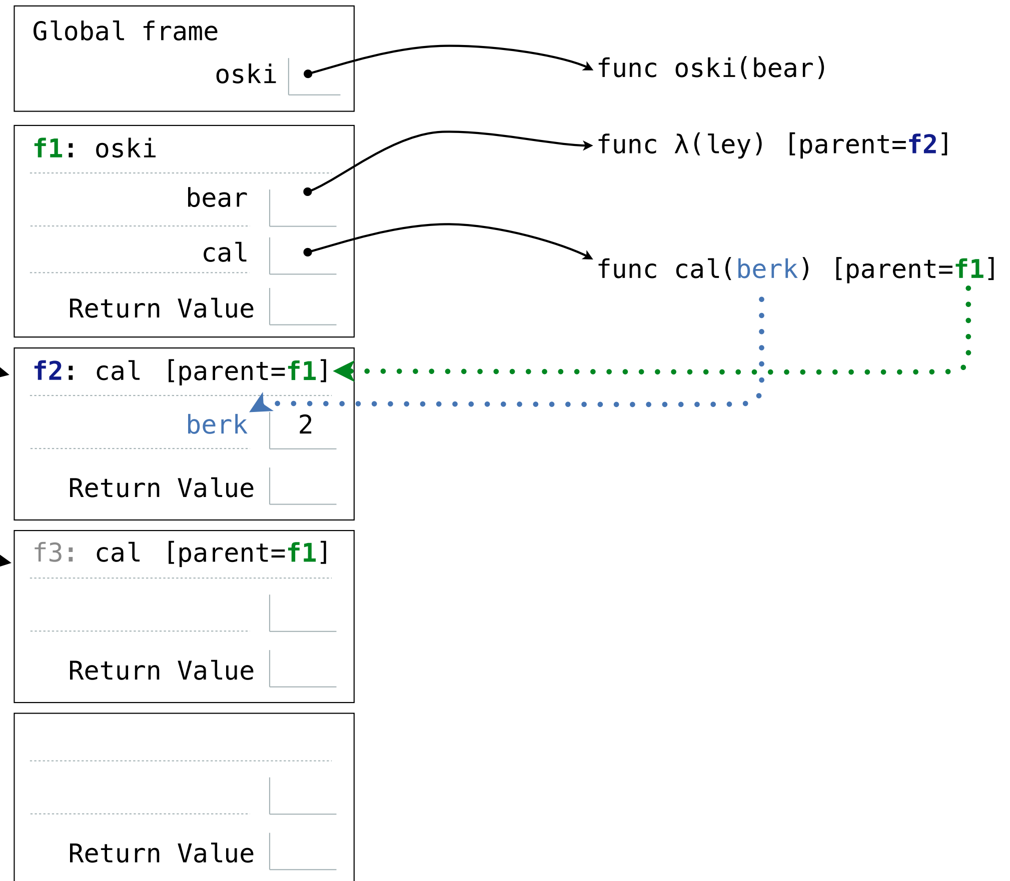

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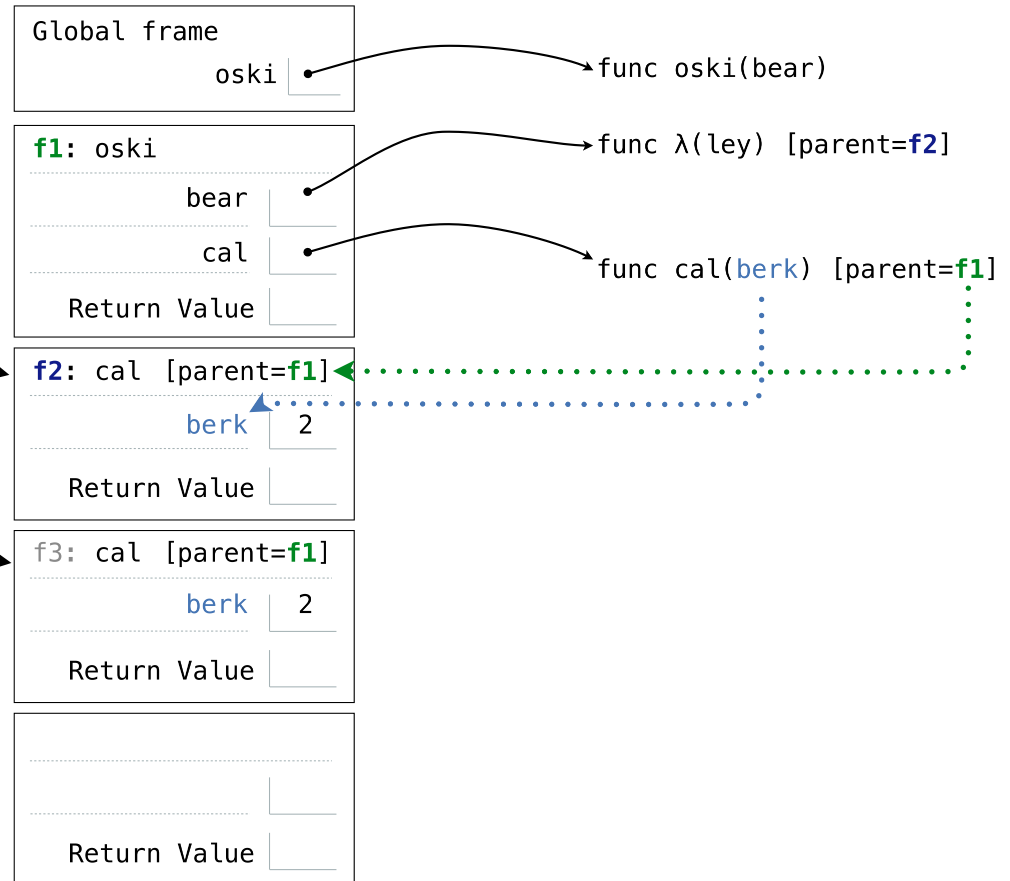

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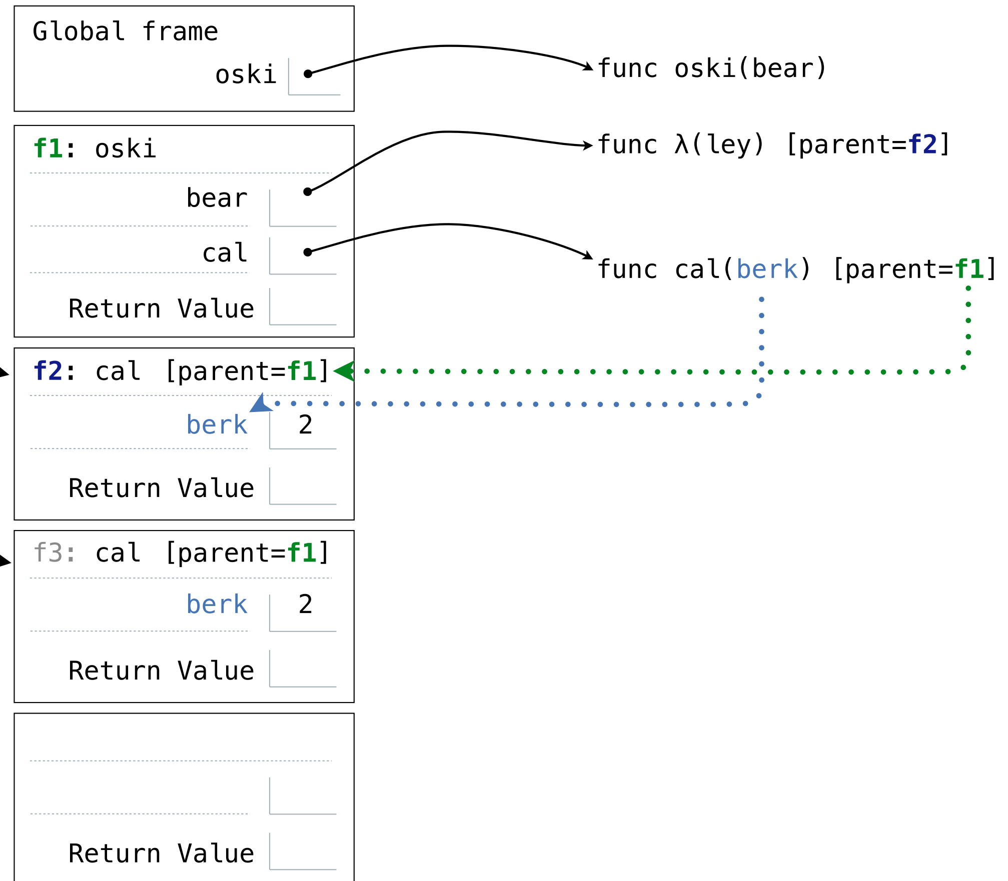

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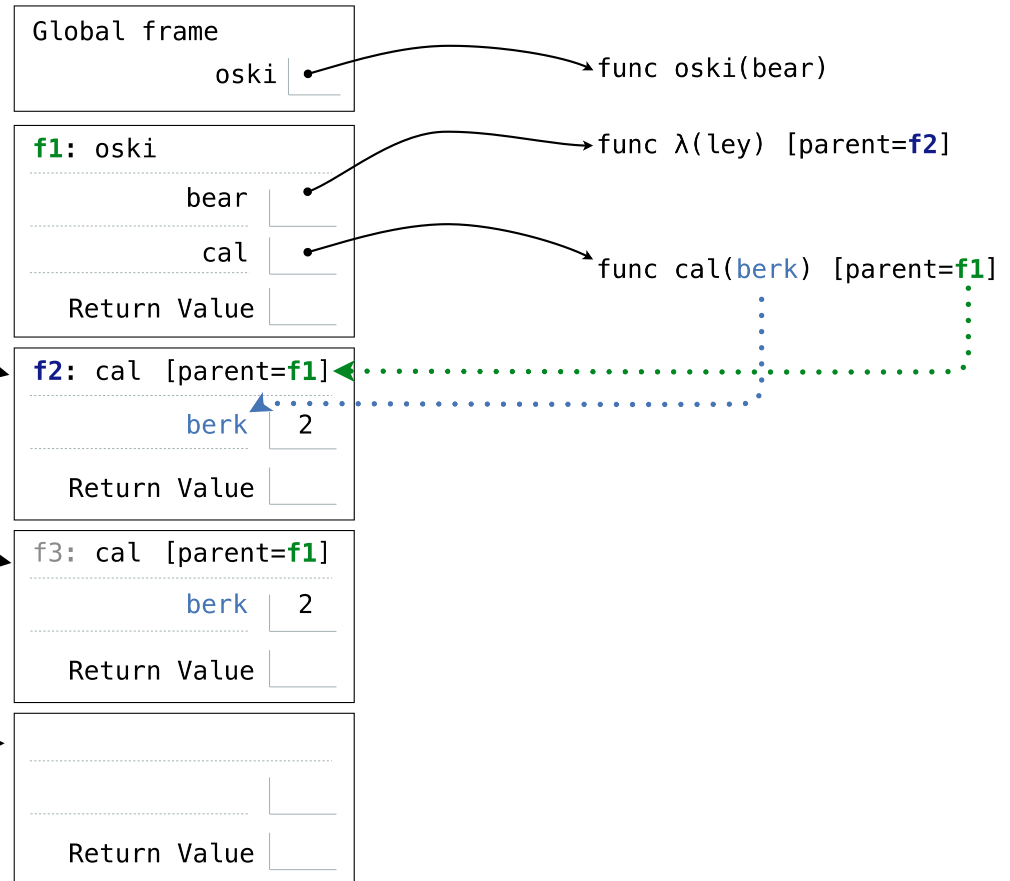

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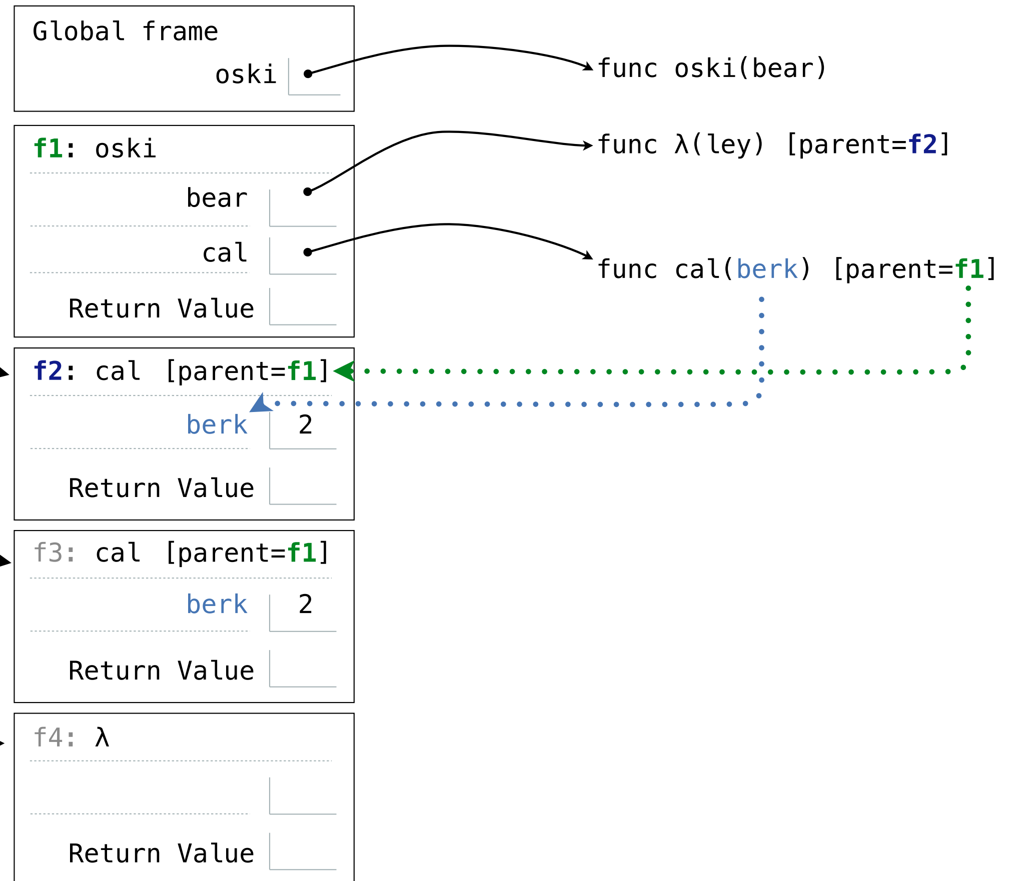

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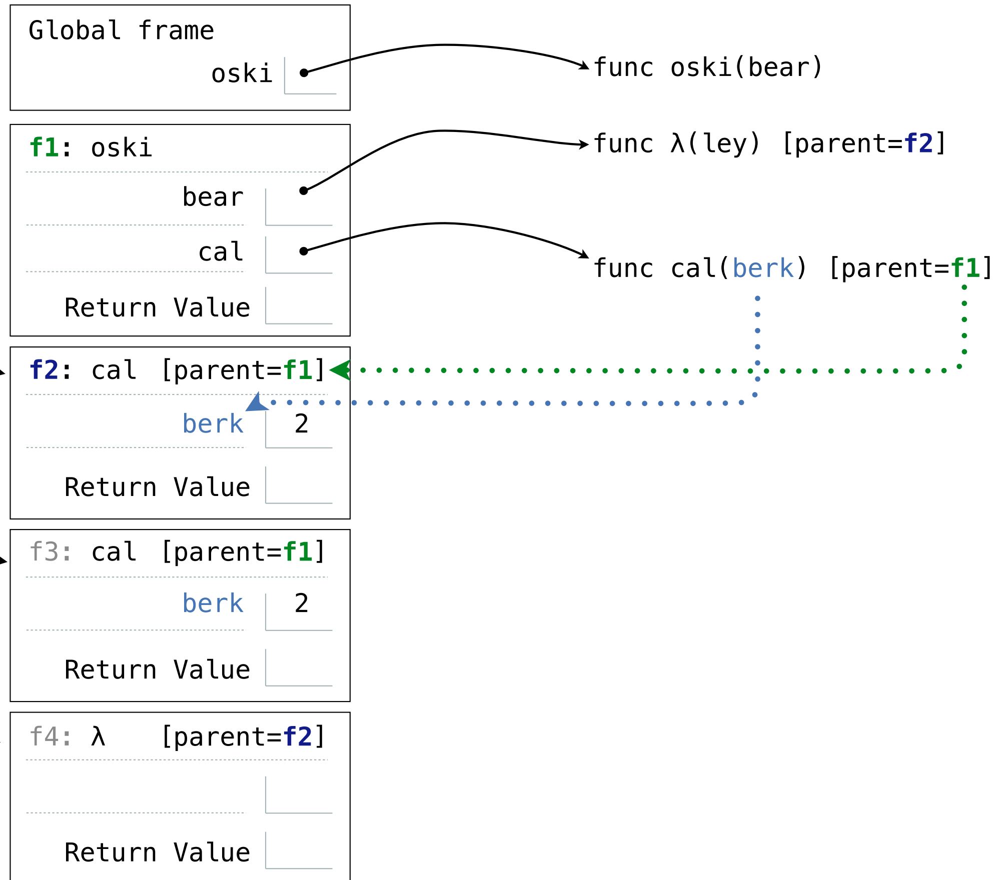

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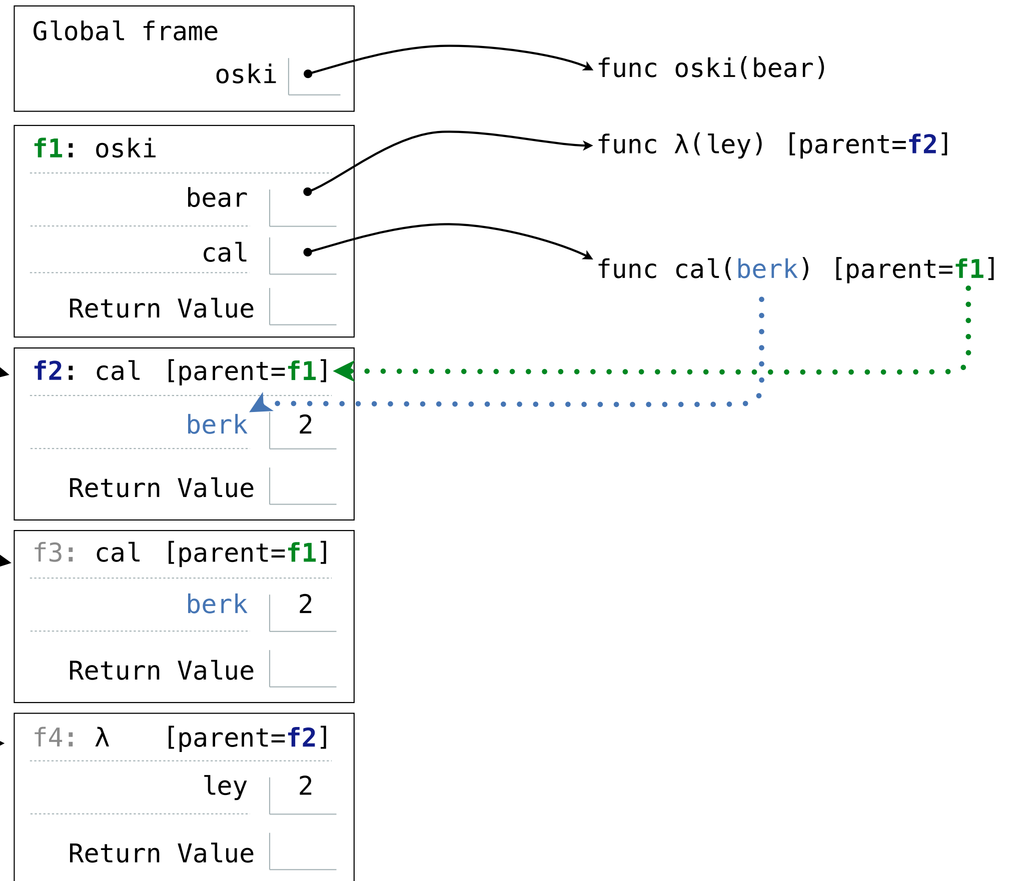

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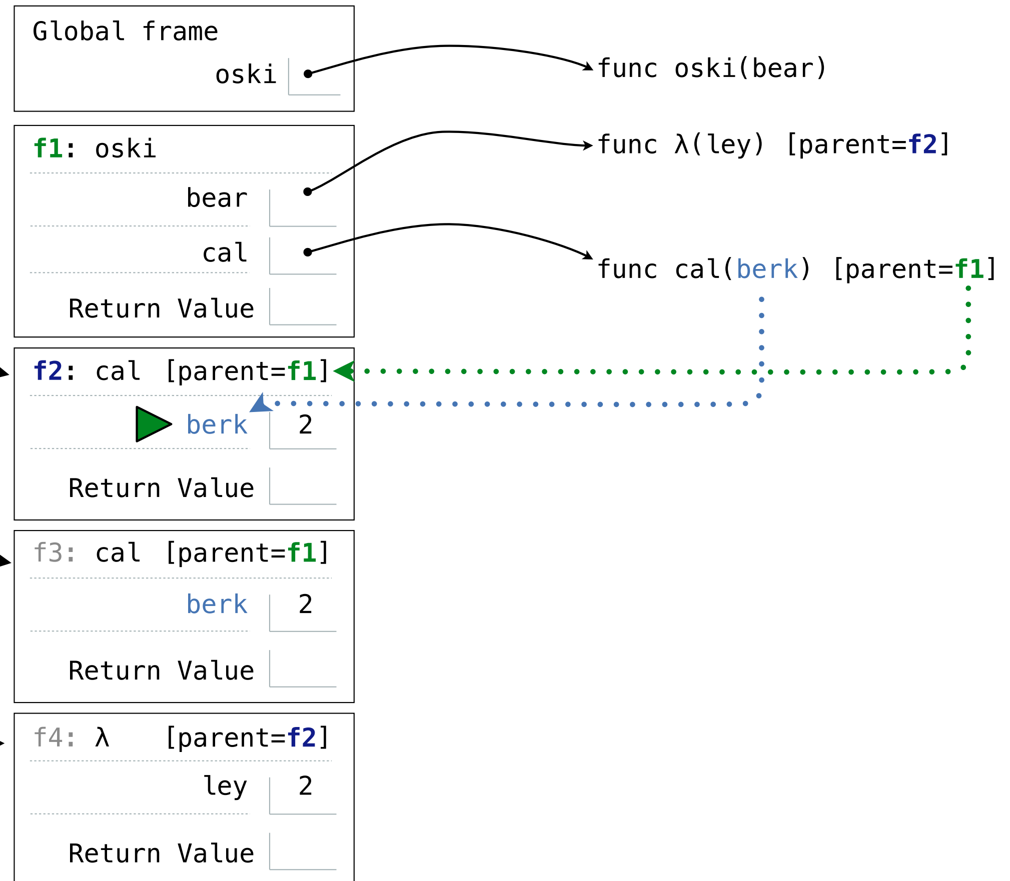

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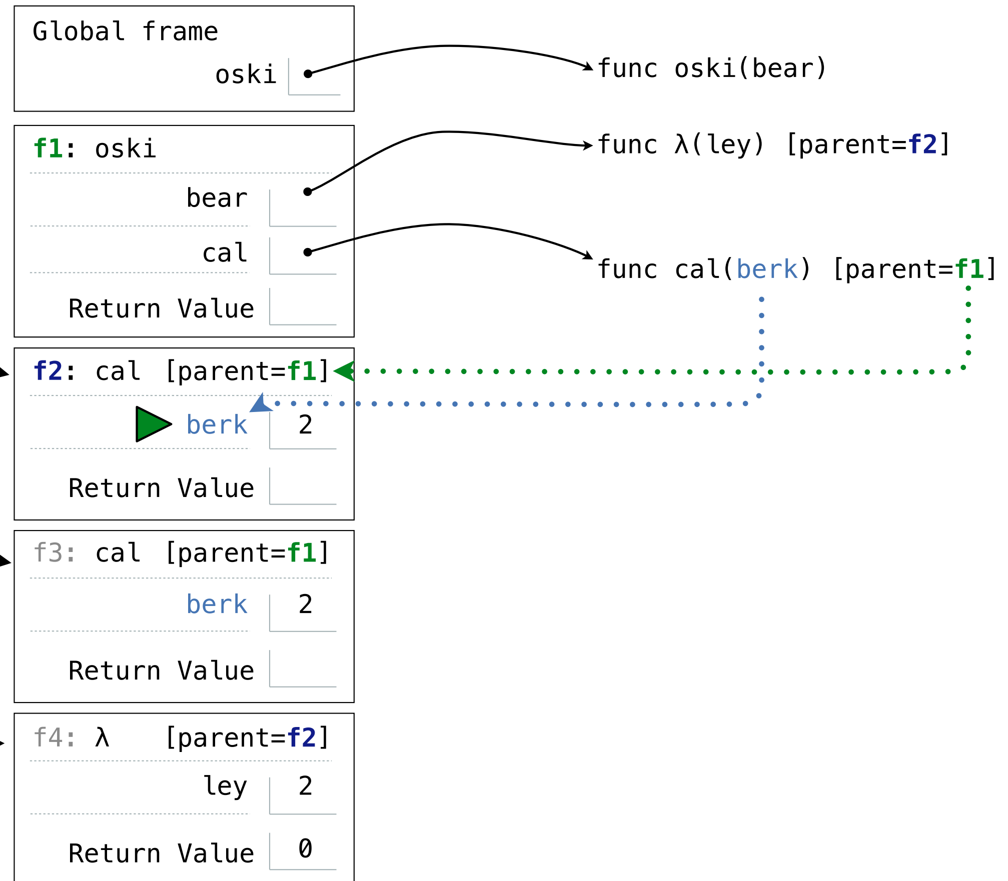

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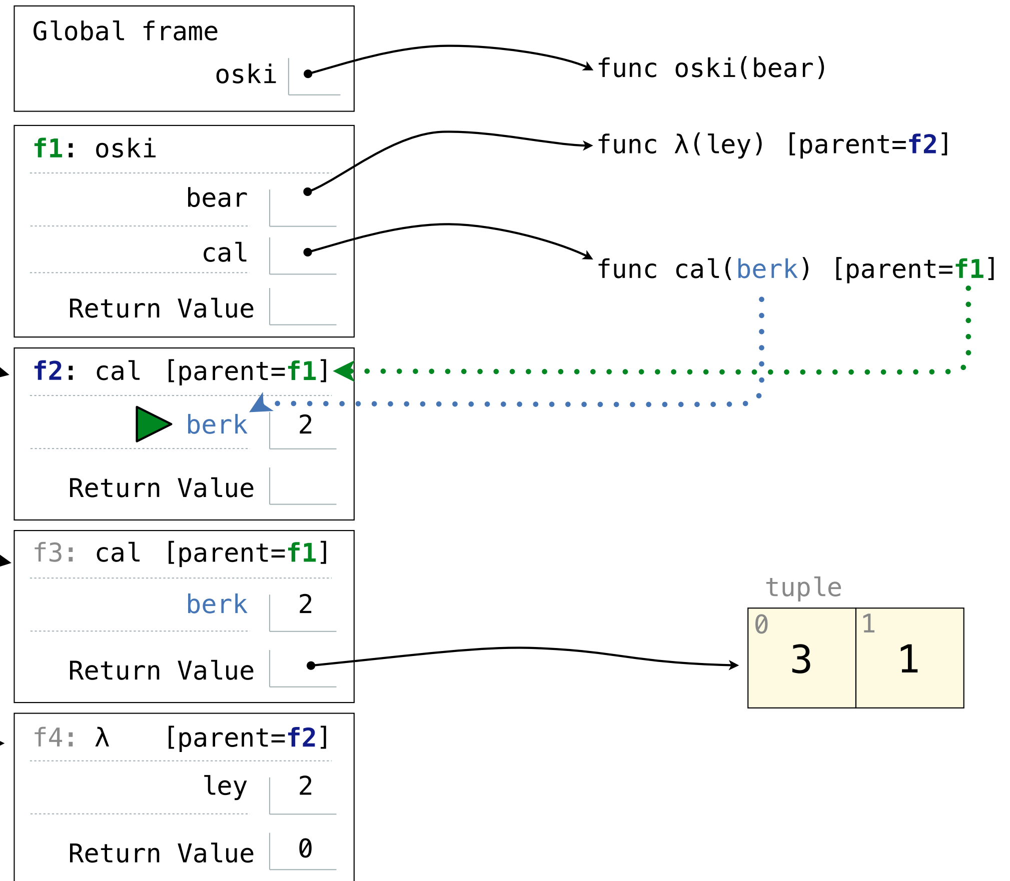

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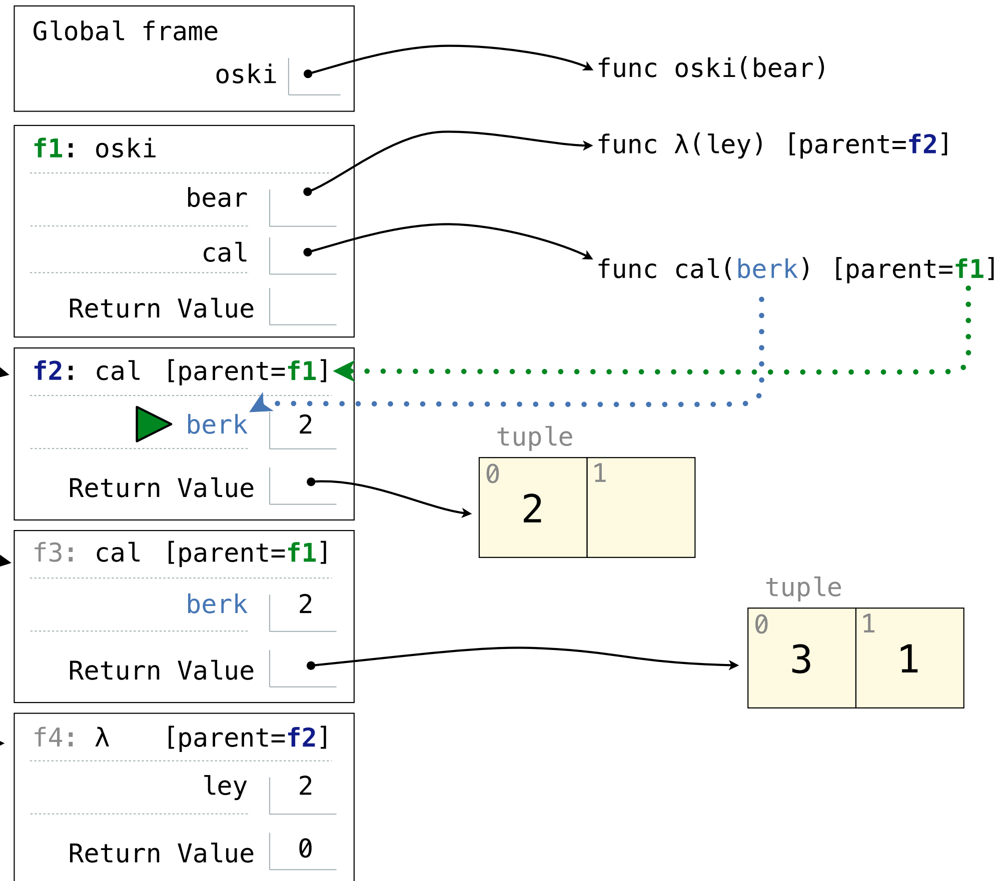

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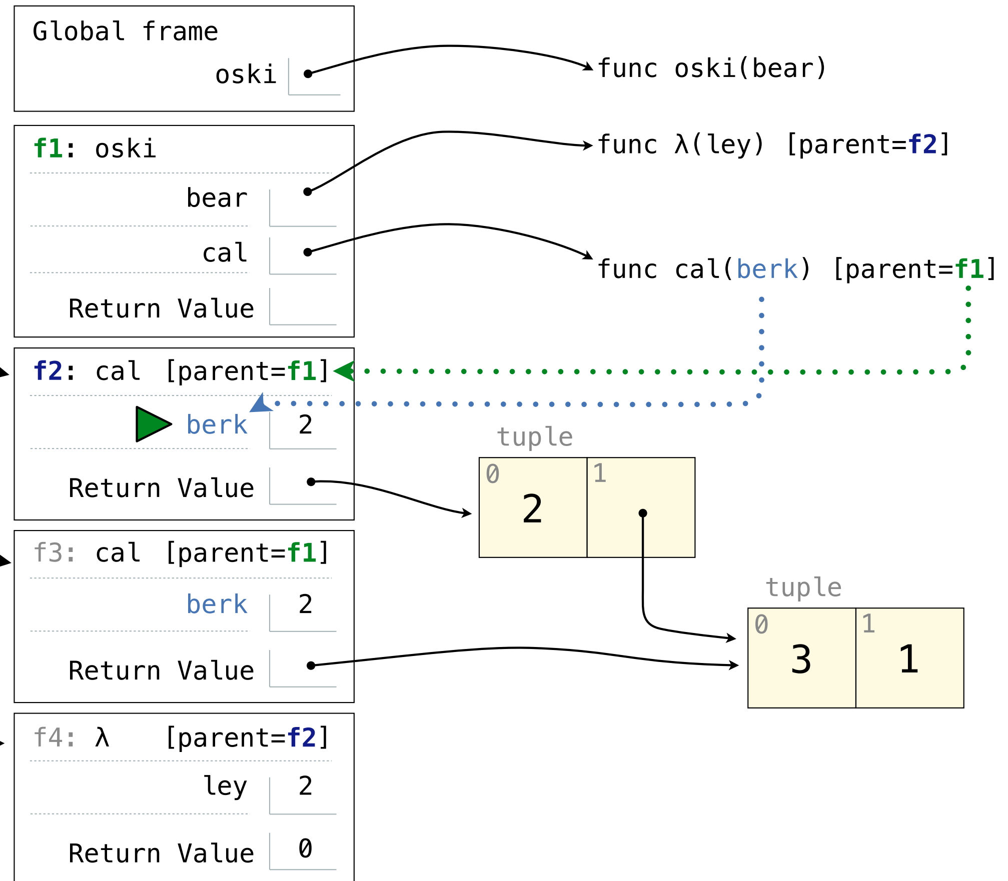

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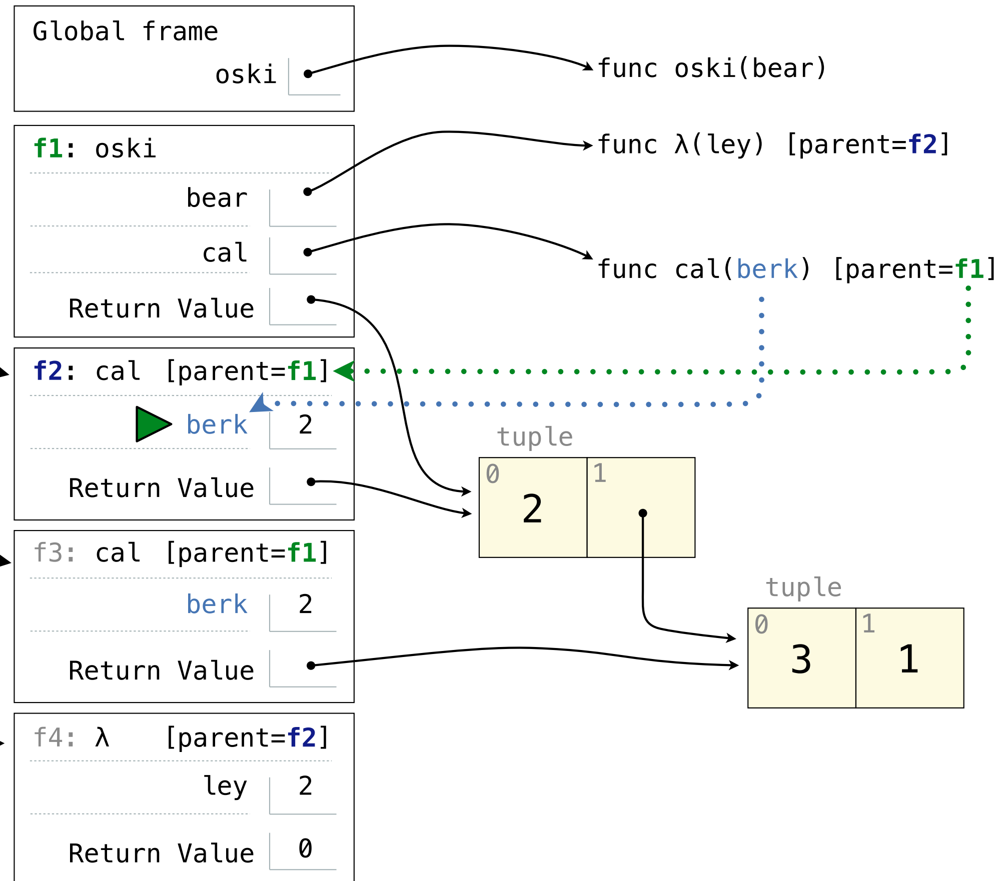

Non-Local Assignment Variants

Go Bears!

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oski(abs)
```
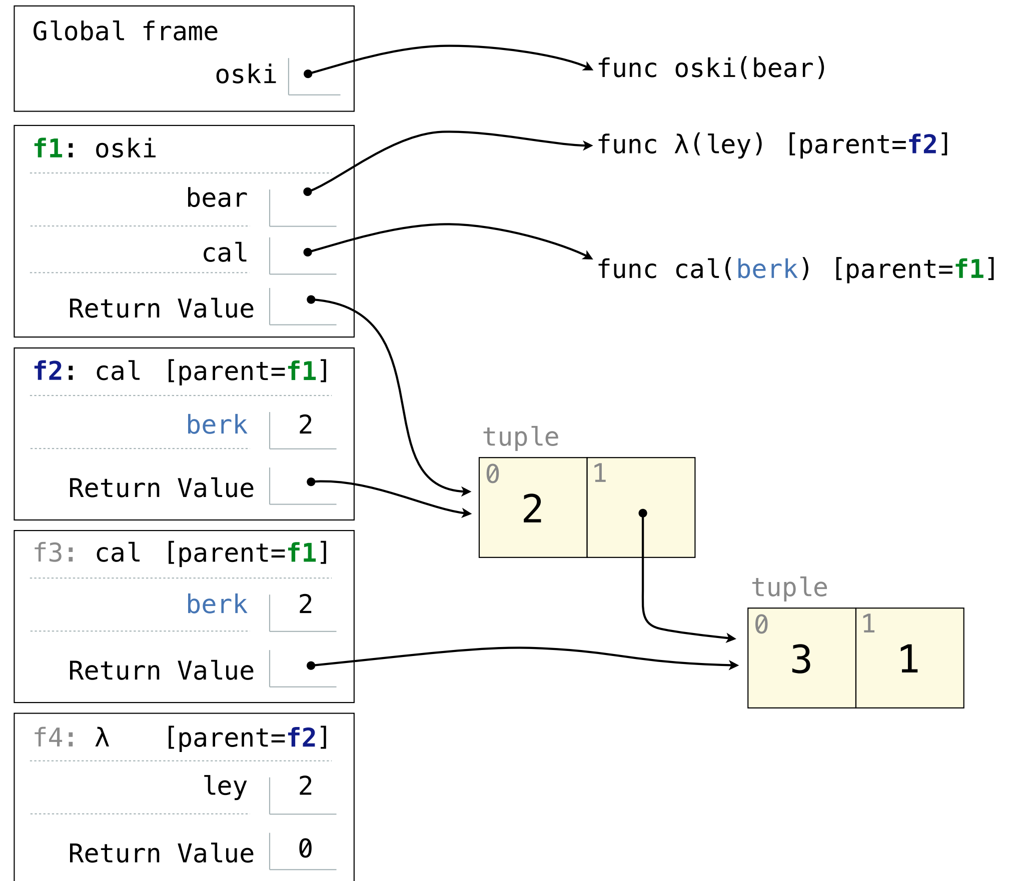
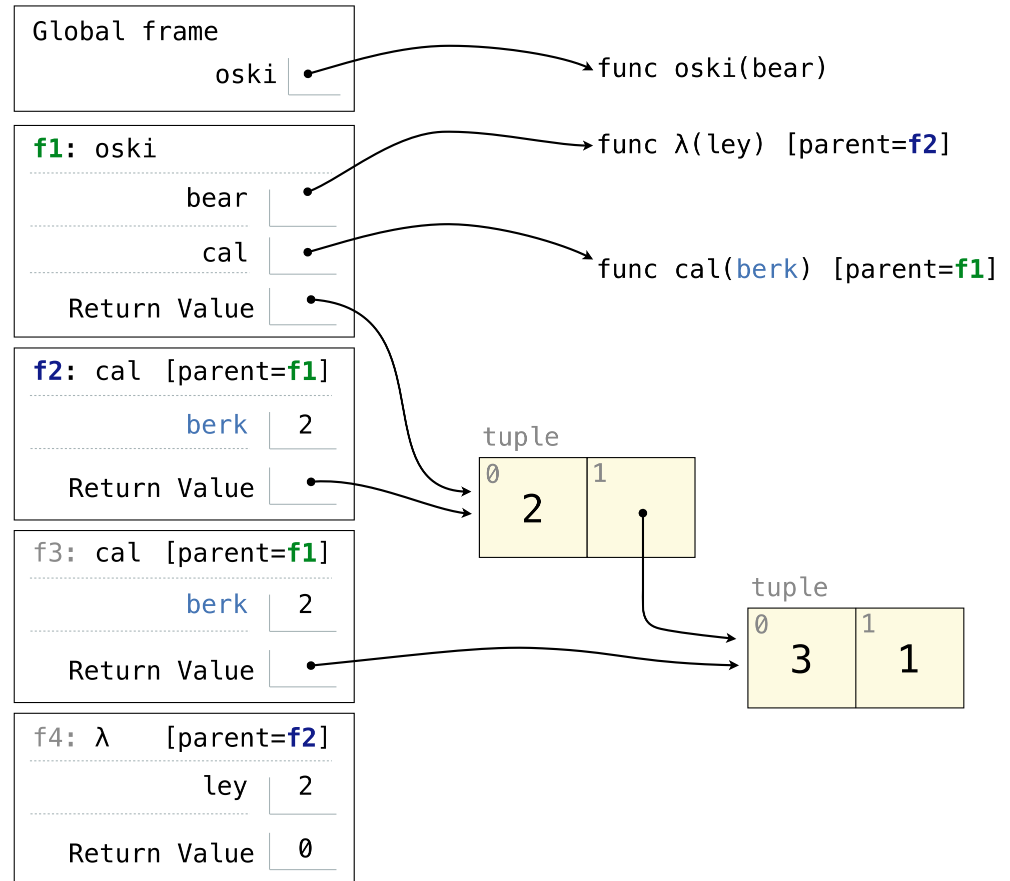



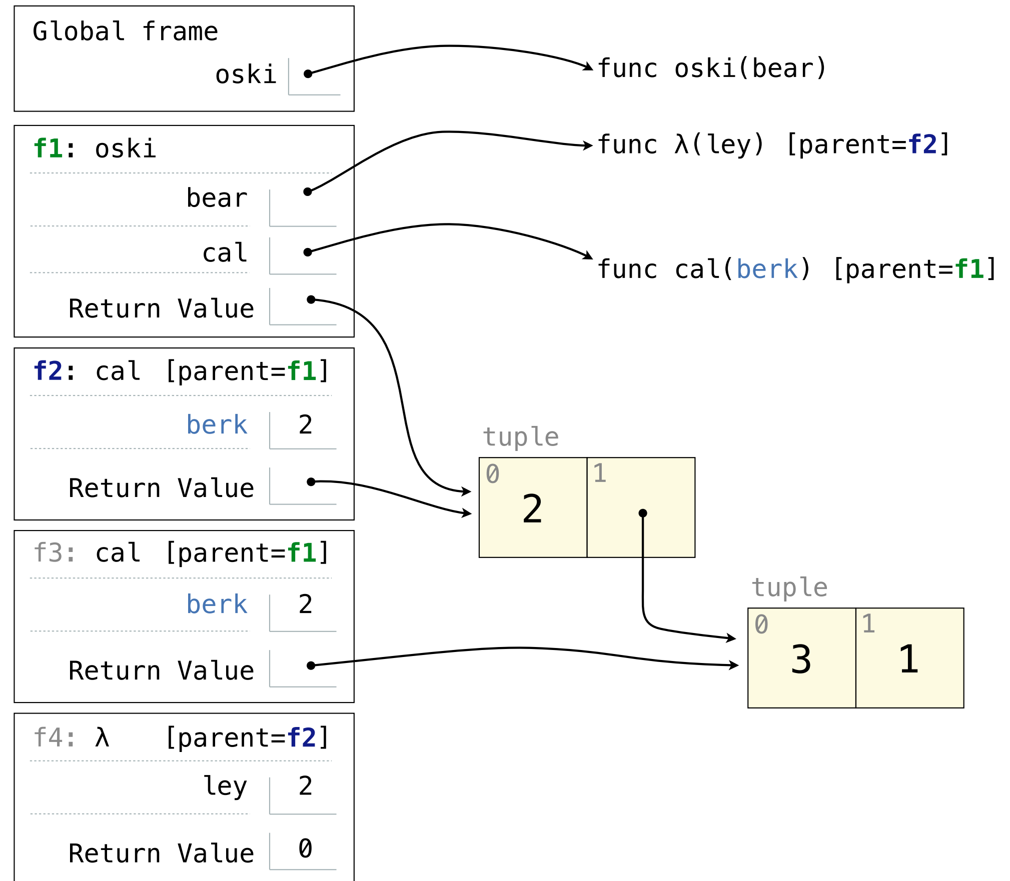
Go Bears!

```
def oski(bear):
    def cal(berk):
        nonlocal bear
        if bear(berk) == 0:
            return (berk+1, berk-1)
        bear = lambda ley: berk-ley
        return (berk, cal(berk))
    return cal(2)
oski(abs)
```



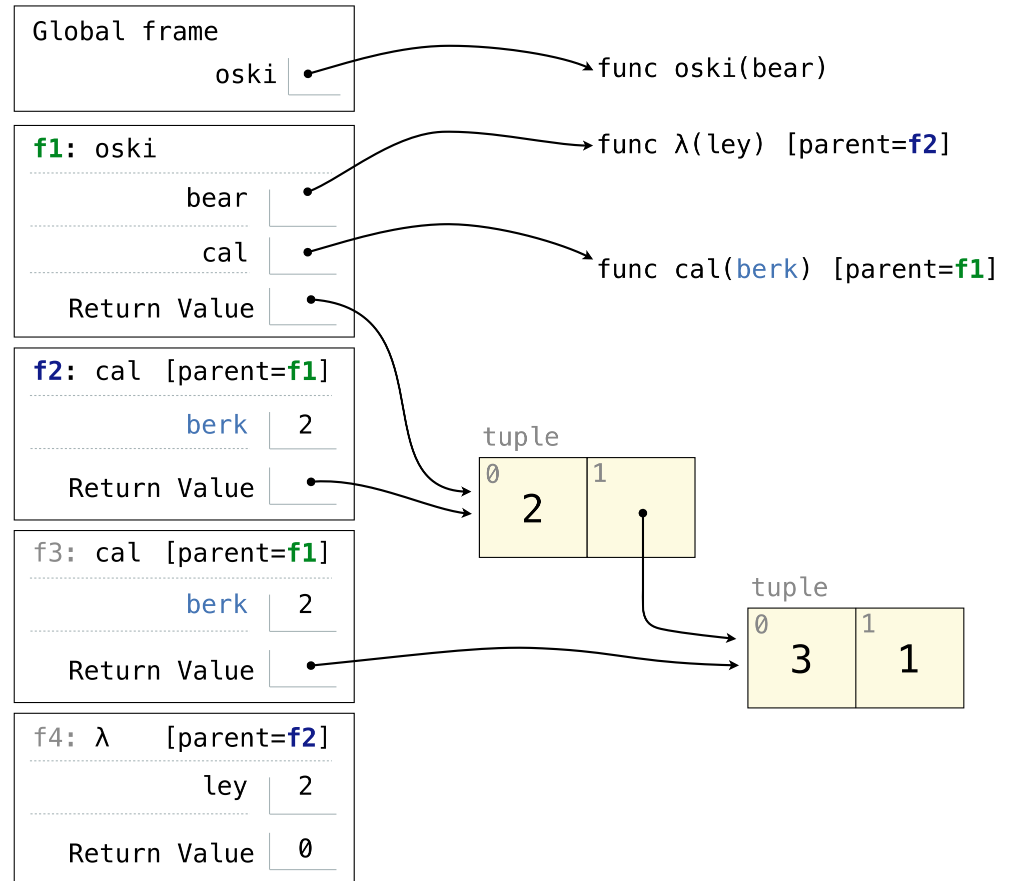
Go Bears!

```
def oski(bear):
    def cal(berk):
        nonlocal bear
        if bear(berk) == 0:
            return (berk+1, berk-1)
        bear = lambda ley: berk-ley
        return (berk, cal(berk))
    return cal(2)
oski(abs)
```



Go Bears!

```
def oski(bear):
    def cal(berk):
        nonlocal bear
        if bear(berk) == 0:
            return (berk+1, berk-1)
        boar
        bear = lambda ley: berk-ley
        return (berk, cal(berk))
    return cal(2)
oski(abs)
```



Go Bears!

```
def oski(bear):
    def cal(berk):
        nonlocal bear
        if bear(berk) == 0:
            return (berk+1, berk-1)
        bear = lambda ley: berk-ley
        return (berk, cal(berk))
    return cal(2)
oski(abs)
```

abs(2)

boar