

# CS 61A Summer 2017

# Structure and Interpretation of Computer Programs

QUIZ 3 SOLUTIONS

## INSTRUCTIONS

- You have 15 minutes to complete this quiz.
- The exam is closed book, closed notes, closed computer, closed calculator.
- The final score for this quiz will be assigned based on **effort** rather than correctness.
- Mark your answers **on the exam itself**. We will *not* grade answers written on scratch paper.
- For multiple choice questions,
  - means mark **all options** that apply
  - means mark a **single choice**

|   |  |
|---|--|
| Last name   |  |
| First name  |  |
| Student ID number   |  |
| CalCentral email (_@berkeley.edu)                                   |  |
| Teaching Assistant  | <input type="radio"/> Alex Stennet <input type="radio"/> Kelly Chen<br><input type="radio"/> Angela Kwon <input type="radio"/> Michael Gibbes<br><input type="radio"/> Ashley Chien <input type="radio"/> Michelle Hwang<br><input type="radio"/> Joyce Luong <input type="radio"/> Mitas Ray<br><input type="radio"/> Karthik Bharathala <input type="radio"/> Rocky Duan<br><input type="radio"/> Kavi Gupta <input type="radio"/> Samantha Wong |
| Name of the person to your left                                     |  |
| Name of the person to your right                                    |  |
| <i>All the work on this exam is my own.</i><br><b>(please sign)</b> |  |

1. (1 points) **Catching Some Zzz's**

Assume that you have started python3 and executed the following expression. What would Python display?

```
(lambda z: z)((lambda z: z)(lambda: lambda: 'Zzz'))
```

- 'Zzz'  
  z  
  z()  
  z: z  
  z: z()  
 **Function**  
 Error  
 Other

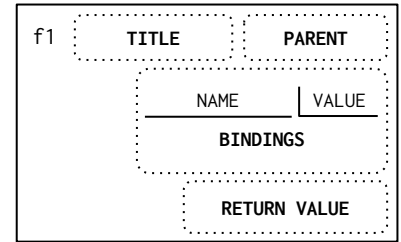
2. (5 points) **Inside Out**

- (a) On the next page, fill in the environment diagram that results from executing the code below until the entire program is finished, an error occurs, or all frames are filled.

*You may not need to use all of the spaces or frames.*

- (b) Then, for each region below, fill in the corresponding bubble. Leave a row blank if the space in the environment diagram should be left blank.

*To receive credit, you must list your bindings in the order in which they are first bound in the frame.*



| FRAME  | FIELD     | NAMES   | VALUES   |
|--------|-----------|---|--|
|        | Binding 1 | inside  | func inside(out) [parent=Global]   |
| Global | Binding 2 | fear  | <input checked="" type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input type="radio"/> γ |
|        | Binding 3 | disgust   | <input type="radio"/> 2 <input type="radio"/> 3 <input checked="" type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input type="radio"/> γ |
|        | Title     | inside  |  |
|        | Binding 1 | out   | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input checked="" type="radio"/> γ |
| f1     | Binding 2 | <input checked="" type="radio"/> anger <input type="radio"/> disgust <input type="radio"/> fear | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input checked="" type="radio"/> α <input type="radio"/> β <input type="radio"/> γ |
|        | Binding 3 | <input type="radio"/> anger <input type="radio"/> disgust <input checked="" type="radio"/> fear | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input checked="" type="radio"/> β <input type="radio"/> γ |
|        | Binding 4 | <input type="radio"/> anger <input checked="" type="radio"/> disgust <input type="radio"/> fear | <input type="radio"/> 2 <input checked="" type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input type="radio"/> γ |
|        | Return    |   | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input checked="" type="radio"/> None  |
|        | Title     | λ < line <input type="radio"/> 2 <input checked="" type="radio"/> 3 <input type="radio"/> 8 >   |  |
| f2     | Binding 1 | <input type="radio"/> anger <input checked="" type="radio"/> disgust <input type="radio"/> fear | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input checked="" type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input type="radio"/> γ |
|        | Return    |   | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input checked="" type="radio"/> 7 <input type="radio"/> None  |
|        | Title     | λ < line <input checked="" type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 8 >   |  |
| f3     | Binding 1 | <input type="radio"/> anger <input type="radio"/> disgust <input checked="" type="radio"/> fear | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input checked="" type="radio"/> γ |
|        | Return    |   | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input checked="" type="radio"/> 7 <input type="radio"/> None  |
|        | Title     | λ < line <input type="radio"/> 2 <input type="radio"/> 3 <input checked="" type="radio"/> 8 >   |  |
| f4     | Binding 1 | <input type="radio"/> anger <input type="radio"/> disgust <input checked="" type="radio"/> fear | <input type="radio"/> 2 <input checked="" type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> α <input type="radio"/> β <input type="radio"/> γ |
|        | Return    |   | <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input checked="" type="radio"/> 7 <input type="radio"/> None  |

**DO NOT TURN IN THIS PAGE.**

**Remember to fill out the choices on the previous page to receive credit for this quiz.**

A complete answer will:

- Add all missing names and parent annotations to all local frames.
- Add all missing values created or referenced during execution.
- Show the return value for each local frame.

```

1 def inside(out):
2     anger = lambda fear: fear(disgust)
3     fear = lambda disgust: anger(out)
4     disgust = 3
5     fear(5)
6
7 fear, disgust = 2, 4
8 inside(lambda fear: fear + disgust)
    
```

|              |  |         |   |                                    |
|--------------|--|---------|---|------------------------------------|
| Global frame |  | inside  |   | → func inside(out) [parent=Global] |
|              |  | fear    | 2 |                                    |
|              |  | disgust | 4 |                                    |

|                            |  |              |      |   |
|----------------------------|--|--------------|------|---|
| f1: inside [parent=Global] |  | out          |      | → func λ(fear) <line 2> [parent=f1]     |
|                            |  | anger        |      | → func λ(disgust) <line 3> [parent=f1]  |
|                            |  | fear         |      |   |
|                            |  | disgust      | 3    |   |
|                            |  | Return Value | None | → func λ(fear) <line 8> [parent=Global] |

|                            |  |              |   |
|----------------------------|--|--------------|---|
| f2: λ <line 3> [parent=f1] |  | disgust      | 5 |
|                            |  | Return Value | 7 |

|                            |  |              |   |
|----------------------------|--|--------------|---|
| f3: λ <line 2> [parent=f1] |  | fear         |   |
|                            |  | Return Value | 7 |

|                                |  |              |   |
|--------------------------------|--|--------------|---|
| f4: λ <line 8> [parent=Global] |  | fear         | 3 |
|                                |  | Return Value | 7 |

**DO NOT TURN IN THIS PAGE.**