

**Crazy Problem Group Work**  
**CSC-014, Dr. Ostheimer**

Suppose that you wrote a program called **foo** with the following input and output:

**Input:** A Python program  $P$ , plus sample data  $D$  for  $P$

**Output:** A boolean value indicating if the program  $P$  would finish in a finite amount of time on the given data  $D$  (so **foo** returns **True** if and only if the program  $P$  finishes in a finite amount of time on  $D$ ).

Notice that I'm *not* asking you to write **foo**: rather I am asking you to *assume* that it is written and working perfectly.

Suppose you then wrote a program called **bar** that looked like this:

```
def bar(program):
    answer = False
    if foo(program, program):
        i = 0
        while True:
            i=i+1
    else:
        answer = True
    return answer
```

I know it's a weird program. But it is syntactically correct, and it will compile beautifully. It is not your job to figure out what this program is *supposed* to do: it is your job to figure out what it *actually* does. The following questions will help you.

1. Suppose that a program  $R$  *does* finish in a finite amount of time when fed  $R$  itself as input data. What would the output be for the following call?

```
>>> foo(R,R)
```

2. Suppose that a program  $R$  *does* finish in a finite amount of time when fed  $R$  itself as input data. What would the output be for the following call? Trace the call carefully.

```
>>> bar(R)
```

3. Suppose that a program  $R$  *does not* finish in a finite amount of time when fed  $R$  itself as input data. What would the output be for the following call?

```
>>> foo(R,R)
```

4. Suppose that a program  $R$  *does not* finish in a finite amount of time when fed  $R$  itself as input data. What would the output be for the following call? Trace the call carefully.

```
>>> bar(R)
```

5. Suppose that a program **bar** *does* finish in a finite amount of time when fed **bar** itself as input data. What would the output be for the following call?

```
>>> bar(bar)
```

6. Suppose that a program **bar** *does not* finish in a finite amount of time when fed **bar** itself as input data. What would the output be for the following call?

```
>>> bar(bar)
```

7. What do you make of all this?