Math 1MP3, midterm test

13 February 2015

- Please write your name and student number on this test and on your answer booklet
- You have 50 minutes
- No external aids (calculator, textbook, notes)
- Please number your answers clearly in the test booklet

1. *String slicing and indexing*: what are the results of the following Python commands? (1 point each)

```
S1 = "Interesting stuff"
```

a. `S1[0]`
b. `S1[-1]`
c. `S1[:len(S1)]`

2. *List slicing, indexing, and manipulation*: what are the results of the following Python commands? (1 point each)

```
L1 = [[1,2,3],[],[4,5]]
```

a. `L1[1:]`
b. `L1[1][0]`
c. `L1 + 2`
d. `L1 + [2]`
e. `L1 + [[2]]`

3. (4 points) You should answer your phone on weekdays if it's between 7 AM and 9 PM (time is measured in 24-hour time (0-23.99), so this means between 7 and 21); on weekends if it's between 10 AM and midnight; and always if it's your mom. If `time` is a numeric value between 0 and 24 (inclusive) and `is_weekday` and `is_mom` are logical (Boolean) values, write a function that begins `def answer_phone(hour,is_weekday,is_mom):` and returns the correct logical value.
4. (6 points) Write a function that takes a tuple and returns a version that is rotated by a specified integer amount (positive=right, negative=left), i.e. `def rot(t,r):` For example, `rot((1,2,3),2)` or `rot((1,2,3),-1)` should both result in `(2,3,1)`. The tuple can be any length: e.g. `rot((7,5,4,9,8),1)` should produce `(8,7,5,4,9)`. You can assume that the absolute value of `r` is less than `len(t)`.
5. (4 points) What is the outcome of the following Python code?

```
L1 = [[0,0],[0,0]]
L2 = L1
L2[0][0] = 2
print(L1)
```

Give a *short* (single sentence/phrase) explanation of what's going on here.

6. (4 points) What is the outcome of the following Python code? Explain what's going on.

```
z = 1
def fun(z):
    z = z + 1
    print(z)
    return(z)

print(fun(z))
print(z)
```

7. (3 points for each separate example) Suppose we are trying to write a function that will approximate the expression $\sum_{k=0}^{\infty} x^{-k}$ by adding terms until the next term is less than a specified tolerance (we'll assume $x > 1$). Each of the following functions has a problem. Explain the problem **and** explain the behaviour of the function (error, infinite loop, wrong answer [be specific], etc.)

a.

```
def fun(x):
    newterm = 1
    k = 0
    v = 0
    while newterm>1e-5:
        newterm = x**(-k)
        v += newterm
    return(v)
```

b.

```
def fun(x):
    newterm = 0
    k = 0
    v = 0
    while newterm>1e-5:
        newterm = x**(-k)
        v += newterm
        k += 1
    return(v)
```

c.

```
def fun(x):
    newterm = 1
    k = 0
    v = 0
    while newterm>1e-5:
        newterm = x**(-k)
        k += 1
    v += newterm
    return(v)
```

8. (8 points) Write a function `fun(val,div,target,maxit)` that returns the number of times (up to a maximum of `maxit`) you need to successively divide `val` by `div` before it is less than `target`. (You can assume that `val`, `div`, and `target` are all positive numeric values, that `div` is >1 [although it shouldn't really matter] and that `maxit` is a positive integer.) If the function reaches `maxit` and the value is still greater than `target`, it should raise a `ValueError`.