2.

```python
def collatz(n):
    lst = []
    lst.append(n)
    if n == 1:
        return lst
    if n % 2 == 0:
        return lst + collatz(n//2)
    else:
        return lst + collatz(3*n+1)
```

Test Runs

```
>>> collatz(15)
[15, 46, 23, 70, 35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1]
>>> collatz(10)
[10, 5, 16, 8, 4, 2, 1]
>>> collatz(11)
[11, 34, 17, 52, 26, 13, 40, 20, 10, 5, 16, 8, 4, 2, 1]
>>> collatz(1)
[1]
>>> collatz(42)
[42, 21, 64, 32, 16, 8, 4, 2, 1]
>>> collatz(83)
[83, 250, 125, 376, 188, 94, 47, 142, 71, 214, 107, 322, 161, 484, 242, 121, 364, 182, 91, 274, 137, 412, 206, 103, 310, 155, 466, 233
, 700, 350, 175, 526, 263, 790, 395, 1186, 593, 1780, 890, 445, 1336, 668, 334, 167, 502, 251, 754, 377, 1132, 566, 283, 850, 425, 127
6, 638, 319, 958, 479, 1438, 719, 2158, 1079, 3238, 1619, 4858, 2429, 7288, 3644, 1822, 911, 2734, 1367, 4102, 2051, 6154, 3077, 9232,
4616, 2308, 1154, 577, 1732, 866, 433, 1300, 650, 325, 976, 488, 244, 122, 61, 184, 92, 46, 23, 70, 35, 106, 53, 160, 80, 40, 20, 10,
5, 16, 8, 4, 2, 1]
>>> |
```

3.

```python
import os.path, os, time
def changed(pathname, k):
    if os.path.isfile(pathname):
        if os.path.getctime(pathname) + (86400*k) > time.time():
            print('{} changed (within last {} days)'.format(pathname,k))
    elif os.path.isdir(pathname):
        try:
            items = os.listdir(pathname)
        except PermissionError:
            print('Found unlistable directory: {}'.format(pathname))
            return
        for item in items:
            newpath = os.path.join(pathname, item)
            changed(newpath, k)
```

Test runs

```
>>> changed('F:\\Testing',1)
F:\Testing\test.txt changed (within last 1 days)
>>> changed('C:\\Users\\foshi\\Desktop\\Files\\Programs',1)
C:\Users\foshi\Desktop\Files\Programs\collatz.py changed (within last 1 days)
C:\Users\foshi\Desktop\Files\Programs\Switch.py changed (within last 1 days)
C:\Users\foshi\Desktop\Files\Programs\Taversal.py changed (within last 1 days)
>>> changed('C:\\Users\\foshi\\Desktop\\Files\\Programs',5)
C:\Users\foshi\Desktop\Files\Programs\collatz.py changed (within last 5 days)
C:\Users\foshi\Desktop\Files\Programs\Switch.py changed (within last 5 days)
C:\Users\foshi\Desktop\Files\Programs\Taversal.py changed (within last 5 days)
C:\Users\foshi\Desktop\Files\Programs\week8b.py changed (within last 5 days)
>>> changed('C:\\Users\\foshi\\Desktop\\Files\\Programs',10)
C:\Users\foshi\Desktop\Files\Programs\collatz.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\firstdigit.py changed (within last 10 days
)
C:\Users\foshi\Desktop\Files\Programs\hidden.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\lookup.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\Switch.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\Taversal.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\week7b.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\week8.py changed (within last 10 days)
C:\Users\foshi\Desktop\Files\Programs\week8b.py changed (within last 10 days)
>>>
```

4.

```python
class Switch(object):

    _switches = 0
    _lamp_on = False
    def __init__(self, state = False):
        self._sw_on = state
        Switch._switches += 1

    def __repr__(self):
        return 'Switch({})'.format(self._sw_on)

    def __eq__(self, other):
        return self._sw_on == other._sw_on

    def toggle(self):
        self._sw_on = not(self._sw_on)
        Switch._lamp_on = not(Switch._lamp_on)

    def switch_on(self):
        return self._sw_on

    def light_on(self):
        return Switch._lamp_on

    def turn_off_switch(self):
        if self._sw_on  == True:
            self._sw_on = False

    def turn_off_lamp(self):
        if self._lamp_on == True:
            self.toggle()

    def num_switches(self):
        return Switch._switches
```

Test Runs:

```
>>> s1 = Switch()
>>> s1.turn_off_lamp()
>>> s1
Switch(False)
>>> s1.light_on()
False
>>> s1.toggle()
>>> s1
Switch(True)
>>> s1.turn_off_lamp()
>>> s1
Switch(False)
>>> s2 = Switch()
>>> s1.num_switches()
2
>>> s1 == s2
True
>>> s2.toggle()
>>> s1 == s2
False
>>> s2.turn_off_switch()
>>> s1 == s2
True
>>> s3 = Switch()
>>> s2.num_switches()
3
```

4b. (Did not work)

```python
def oldest(pathname):
    if os.path.isfile(pathname):
        return os.path.getctime(pathname)
    elif os.path.isdir(pathname):
        try:
            items = os.listdir(pathname)
        except PermissionError:
            print('Found unlistable directory: {}'.format(pathname))
            return
        bigsec = 0
        for item in items:
            newpath = os.path.join(pathname, item)
            bigsec += oldest(newpath)
        return bigsec
    return '({},{})'.format(bigsec,pathname)
```

Test runs:

```
>>> oldest('F:\\Testing')
1572932870.68
```