Week 09 Map, Filter, Reduce

Part 1 Map and Filter

In this question, we refer to OUR version of `map()`, but Python's version of `filter()`.

In this exercise, please try to come out with the answer without using IDLE/Python first. Then type in the expressions into IDLE to verify your answers. The objective is for you to understand why and how they work. If there is an error, specify the error and the cause of error.

Let L = `[9,2,1,3,4,5,6]`

Expressions	**Output**
`map(lambda x: x > 2, L)`	
`list(filter(lambda x:x>2,L))`	
`map(lambda x: 'o' if x%2 else 'e',L)`	
`list(filter(lambda x: 'o' if x%2 else 'e',L))`	
`map(str,list(filter(lambda x:x%2,L)))`	
`str(list(filter(lambda x:x>30,map(lambda x:x*x,L))))`	

Part 2 Scale/Square Tuples

We have talked about how to scale or square a list of numbers. How to change your code such that it can work for tuple?

Part 3

We did the "Sum Digit Square" before. How do we do SDS by using map() and sum()?

Part 4 Taylor Series Using map()

Taylor series are the sum of many terms, e.g.

$$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1} = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \cdots \quad \text{for all } x$$

$$\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!} x^{2n} = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \cdots \quad \text{for all } x$$

$$\tan x = \sum_{n=1}^{\infty} \frac{B_{2n}(-4)^n\left(1-4^n\right)}{(2n)!} x^{2n-1} = x + \frac{x^3}{3} + \frac{2x^5}{15} + \cdots \quad \text{for } |x| < \frac{\pi}{2}$$

How do we use map() and sum() to compute the above WITHOUT any iterations or recursions?

Part 5 Reduce()

Here is the code for reduce().

```
def reduce(f,seq):
    if not seq:
        return seq
    first = seq[0]
    for i in seq[1:]:
        first = f(first,i)
    return first
```

Predict what the function will do when we call

```
reduce(lambda x,y:x+y,[1,2,3,4])
```