CS 421 --- State Activity

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Please write your name/netid legibly in dark ink. Hand in one copy per team. Do not staple or mangle the corners.

Challenge

**Example 1)** Can you write a counter function (or function producer) without using objects and without using global variables?

Two hints: python supports HOFs and nested function declarations. To access an outer scoped variable, use the `nonlocal` keyword. Here is a convoluted ``increment'' function that shows some of the features you will need.

```python
def inc(x):
    i = x

def doit():
    nonlocal i
    i = i + 1

doit()
return i
```

**Problem 1)** Consider this Python code.

```python
class Delay:
    def __init__(self, action):
        self.action = action
        self.status = 0

    def report(x):
        print("Thunk executed: {} ".format(x))
        return x

    def force(self):
        if self.status == 2:
            return self.value
        elif self.status == 0:
            self.status = 1
            self.value = Delay.report(self.action())
            self.status = 2
            return self.value
        else:
            return Exception("It broke!")
```
• Review this code with a partner. Can you figure out how to use it?
• What is the purpose of self.status = 1?
Consider this function and list definition.

```python
def lazyTake(n, x):
    if x==() or n<1:
        return ()
    else:
        return (x[0], lazyTake(n-1, x[1].force()))
l1 = (2, Delay(lambda: (3, Delay(lambda: (5, Delay(lambda: ())))))))
```

**Problem 2)** Can you write `lazyTail`, `lazyMap`, and `lazyZipWith`?

**Problem 3)** Use these functions to make the infinite list of natural numbers and Fibonacci numbers.