

Name: _____ Recitation: _____ Andrew Id: _____

15-112 Spring 2018 Quiz 9

Up to 20 minutes. No calculators, no notes, no books, no computers. Show your work!

1. (10 points) **Short Answer:** Briefly explain the difference between an attribute and a method, and write a couple of lines of code as an example to demonstrate your point.

2. (25 points) **Free Response:** Write a recursive function (do **not** use iteration) `hasEven(L)` that returns `True` if there is an even integer in `L` and `False` otherwise. The list `L` may contain non-integers. For example `hasEven([1,"abc",set(),4,6,{}])` returns `True`. Remember not to use loops.

3. (25 points) **Free Response:** Write a recursive function (do **not** use iteration or strings) `sumSquareEvenDigits(n)` that returns the sum of the square of the even digits of `n`. You may assume that `n` is a positive integer. For example `sumSquareEvenDigits(58474)` returns `96` ($8^2+4^2+4^2$). If a number has no even digits, return `0`. Remember not to use strings or loops.

4. (40 points) **Free Response:** Write the class Gate (implementing the logic gates AND, OR) and the child class NegatedGate (implementing the logic gates NAND, NOR, which have the opposite return values of AND, OR) that pass the following test cases. You may not hardcode any test cases. The method `eval` of the class NegatedGate must call the method in its parent class.

```
gate1=Gate("and") # (type of gate)
assert((gate1.eval(True,True)==True) and (gate1.eval(True,False)==False))
assert(str(gate1)=="and gate")
assert(str(NegatedGate("and"))=="Nand gate")
gate2=NegatedGate("or") # Nor gate
assert((gate2.eval(False,True)==False) and (gate2.eval(False,False)==True))
assert(str(gate2)=="Nor gate")
assert(gate1==Gate("and"))
assert(gate1!=NegatedGate("and"))
assert(gate1!="and gate") # don't crash!
s=set()
s.add(NegatedGate("or"))
assert(gate2 in s)
```

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