Name:_____ Section:___ Andrew Id: _____

15-110 Fall 2018 Quiz 3

*** 20 minutes**
*** No calculators, no notes, no books, no computers.**
*** Show your work when possible!**

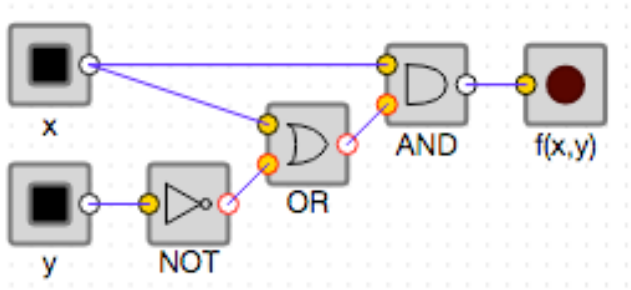
1. **Code Tracing [10 pts]** Indicate what the following program prints. Place your answer in the box.

```
def f(m, n):
    j = 0
    k = 0
    for x in range(m, n):
        j += x
        k += 2
    return j*k
print(f(2,4))
```

2. **Code Tracing [10 pts]** Indicate what the following program prints. Place your answer in the box.

```
def f(z):
    m = 0
    while (m < z):
        m = (m + 1)*2
    return m-z
print(f(8) + f(-8))
```

3. **Logic Circuits and Truth Tables [20 pts; 5 pts each value]**
   Given this circuit:



Fill out this truth table for f(x,y):

x	y	f(x,y)
0	0	
0	1	
1	0	
1	1	

4. **Very Short Answers [20 pts; 5 pts each]**
   a. In just a single word, what component of sand makes it useful for building computers?

   b. When we add two 1-bit values x and y, the result is a two-bit value. The ones-digit (low-order bit) of the result is (x xor y). Write a similar logical function for the twos-digit (high-order bit) of the result.

   c. Fill in the blank from the notes: "Any logical function can be written in Disjunctive Normal Form (DNF)... So, critically, given an arbitrary logical function, we only need _____ gates to build a machine that computes it."

   d. In the number-guessing game from our case study, the user picks a number between 0 and 100, inclusive, and the computer guesses 50. If that is too high, its next guess is 24. Very briefly, but precisely, why is that guess 24 and not 25?

5. **Free Response: hasAllOddDigits(n) [40 pts]**
   Write the function hasAllOddDigits(n) that takes an integer n and returns True if all the digits in n are odd and False otherwise. So hasAllOddDigits(1331759) returns True and hasAllOddDigits(1331659) returns False.
   Note: do not use strings in your solution!

6. **Bonus/Optional: Code Tracing [2.5 pts each]:**
   Indicate what each of the following programs prints. Clearly circle your answers (and nothing else).

```
# Bonus CT2:
def ct1(x, y):
  while (x < y):
    for z in range(2+x):
        x += z
  return x
print(1+ct1(2,ct1(1,2)))
```

```
# Bonus CT2:
def ct2(n):
  s = '1'*100
  while (int(s,2) > n):
    s = s[1:-1]
  return n + int(s, 2)
print(ct2(35))
```