

**15-112 Midterm 2 Review**

Up to 75 minutes. No calculators, no notes, no books, no computers. Show your work!  
Do not use try/except on this review.

1. ( points) CT1

```
def ct1(L):  
    s = set()  
    for v in L:  
        if isinstance(v, dict):  
            for k in v:  
                s.add(v[k])  
        else:  
            for e in v:  
                if e in s:  
                    s.remove(e)  
    print(s)  
    return s  
  
print(ct1(['CB', {2:'A', 'B':3, 4:'C'},  
          'BC', [4, 3, 2]]))
```

2. ( points) CT2

```
import copy

def ct2(L, A, n):
    A[-1][0] += n
    A[n%2] += [10*n]
    L.append(n)
    print(f'A: {A}')

L = [[3], [4]]
C = copy.copy(L)
D = copy.deepcopy(L)
ct2(L, C, 1)
ct2(L, D, 2)
print(f'L: {L}')
```

3. ( points) **Free Response: Recursive getHiLo**

Write the recursive function `getHiLo(lst)` which, given a list of integers `lst` returns a tuple contain the highest and lowest values in the list. For example:

`getHiLo([1, 7, 3, 8, 2, 9, 6, 4, 5])` returns `(9,1)`

`getHiLo([5])` returns `(5,5)`

`getHiLo([])` returns `None`

**Your solution must use recursion. If you use any loops, comprehensions, or iterative functions, you will receive no points on this problem.**

4. ( points) **Free Response: Find Zero Triplets**

Write the function `findZeroTriplets(L)` that takes as input a list `L` of integers of length `N` and returns a set of all triplets in the list whose sum is equal to 0. For example, if the given list is `[-1, 0, -3, 2, 1]`, you should return `{(-1, 0, 1), (-3, 1, 2)}` (note that triplets are sorted). If there is no valid triplet, you should return the empty set. You may assume that `L` is a list containing only integers. The *naive* solution would use 3 loops to check all triplets of values in `L`.

**You should use sets and/or dictionaries to do this faster than  $O(N^3)$**

You should also specify the Big-O of your solution in the box below:

5. ( points) **Big-O:** For the functions shown below, write the total Big-O runtime of the function in terms of  $N$ , the length of the function argument, in the box to the right of the code. All answers must be simplified- do not include lower-order terms!

```

1 def f1(L): # L contains N items    #BigO
2     M = sorted(L)                  #-----
3     count = 0                      #-----
4     for elem in M:                  #-----
5         count += M.count(elem)      #-----
6         #update elem                #-----
7     return count                   #-----

```

```

1 def f2(L): # L contains N items    #BigO
2     newL = []                      #-----
3     n = len(L)                    #-----
4     for i in range(0, n, n//4):    #-----
5         newL.append(L.pop())       #-----
6         #update i                  #-----
7     return newL                   #-----

```

```

1
2 def f3(s): # s contains N characters #BigO
3     if s.isdigit():                #-----
4         letters = set(s)           #-----
5         for c in letters:           #-----
6             if c == '4':            #-----
7                 return "YES"        #-----
8                 #update c           #-----
9     return "NO"                    #-----

```