Name and UTEID:

- You are allowed 100 mins.
- Open book/notes/web—you cannot message anyone in any form.
- Write your answers on the exam.
- Show your work and give explanations.

Question:	1	2	3	4	5	6	7	8	9	10	11	12	Total
Points:	9	4	6	6	8	4	6	7	8	12	8	12	90

9 marks 1. What are the differences (if any) between `x`, `y`, and `z` in the code below? Where possible, suggest tests that differentiate between these variables.

```
x = 12
y = 12.0
z = "12"
```

4 marks 2. Give two differences between a compiled and interpreted language.

6 marks 3. What is the difference between `break` and `continue`? Suppose you were trying to find the sum of the squares of the positive integers in an array of integers (which may contain negative entries)—would `break` or `continue` be more appropriate?

6 marks 4. Explain the output of the program below.

```
def foo(anInt, aList, bList):
  anInt = 42
  aList = [1,2,3]
  bList[0] = 42

x = 31
A = [2, 7, 11]
B = [44, 9]

print "before:", x, A, B
foo(x,A,B)
print "after:", x, A, B
```

The output is

```
before: 31 [2, 7, 11] [44, 9]
after: 31 [2, 7, 11] [42, 9]
```

8 marks 5. Hand execute the function below on `A = [9,6,2,7,3,5,1,5,4]`. Show the values of the `min` and `max` variables as the program executes.

```
def mystery(A):
  max = 0
  if ( len(A) == 1 ):
    raise ValueError("length 1 input");
  min = A[0];
  for i in range(len(A)):
    if ( max < ( A[i] - min ) ):
      max = A[i] - min
    if ( min > A[i]):
      min = A[i]
  return max
```

4 marks

6. Suppose you were required to write a web service to which a `String` which represents the id of a Netflix customer, is passed in. Your service is to return the address (also a `String`) of the customer.

   What would be an appropriate data structure to back the web service with if fast lookup times are required?

6 marks

7. List three reasons why a file must be opened before it can be read.

7 marks

8. Write a function to read through a text file and print the contents of the file (line by line) all in lower case.

8 marks

9. Give two differences and two similarities between the dictionary and list types.

12 marks

10. Write a short essay on regular expressions. Touch upon what they are, where they are useful, and what their limitations are.

8 marks

11. Write a regular expression that can be used to find 10 digit phone numbers in a text file. Phone numbers may be have a single blank or hyphen after area code, as well as the first three digits of the 7-digit phone number. Ignore the possibility of the area code being wrapped in parens.

12 marks

12. Write a Python program that takes as input two lists $L1$ and $L2$, and returns their "zip". The zip of two lists is a list consisting of the alternation of elements from $L1$ and $L2$. If the input lists are of unequal length, the excess elements are added to the end.

    For example, the zip of $[1, 3, 5]$ and $[2, 4, 6]$ is $[1, 2, 3, 4, 5, 6]$; the zip of $['a', 'l', 'p', 'h', 'a']$ with $['c', 'h', 'i']$ is $['a', 'c', 'l', 'h', 'p', 'i', 'h', 'a']$.

    You cannot use any library methods.

```
def my_zip(L1, L2):
  result = []
  # your code goes here
  return result
```