**COMP 4030/6030** Spring 2018. Assignment 2

**Due:** Feb 13, 2018 (before class starts)

**Assignment:**

1. (20 points) Every node in a binary tree can have 0, 1 or 2 children. A leaf node has no children. Write a Python function to decide whether all nodes, except leaves, in a tree have exactly two children.

# Input: a node which is the root of the tree

# Output: True if all nodes in the tree have either 0 or 2 children.

# False if some node has only one child.

# (leaves) or exactly two children (internal nodes).

**def is\_full\_house( root\_node ):**

**# your code…**

1. (10 points) Given the following function

# Input: a list of numbers, L.

# Output: a number

**def do\_something( L ):**

**s = 0**

**for x in L:**

**s = s + x**

**print(s)**

**for y in L:**

**s = s + y**

**print(s, x, y)**

**for z in L:**

**s = s + z**

**s = s\*5**

**return s**

Let T(n) be the running time function of do\_**something**. What is n?

1. (15 points) Continuing with problem 2. Write down T(n) as accurately as you can, with specific numbers.
2. (10 points) Continuing with problem 3. Describe T(n) using big-O notation.
3. (15 points) Given the following function

# Input: a list of numbers L

# Output: a number

def foo(L):

s = 0

for x in L:

j = len(L)

while j > 1:

j = j / 2

s = s + x

print(s)

return s

Let T(n) be the running time function of **foo**. Write down T(n) as accurately as you can, with specific numbers.

1. (10 points) Describe T(n) using big-O notation.
2. (10 points) Describe 20n + 5n2 using big-O notation.
3. (10 points) Describe 10n3 + 20n2 using big-O notation.

**Plagiarism Policy:**

You can discuss how to solve the problems with your classmates, but the solution must be your own. Using other people’s solution will result in a zero for the assignment and possible additional penalties.

**Submission**:

Put Python code in one Python (.py) file. Put other work in a separate text file.

Put your name as part of the file name. For example: If your name is John Smith, name your files like this: **JohnSmith\_hw2.py** and **JohnSmith\_hw2.txt** (or **JohnSmith\_hw2.docx**).

Upload your submission to the Assignment 2 folder in the eCourseware Dropbox.