CS 151 **Exam-1** **March 4, 2004**

This Quiz is being given under the guidelines of the **Honor Code**. You are expected to respect those guidelines and to report those who do not. Answer the questions in the spaces provided. If you run out of room for an answer, continue on the back of the page. There are 8 questions for a total of 74 points.

Name: _____

1. Given the following command and output:

```
binkley:testDir> ps -aux
USER       PID %CPU %MEM   VSZ  RSS TTY      STAT START   TIME COMMAND
root       716  0.0  0.0  1364  424 ?        S    Feb22   0:00 klogd -x
rpc        736  0.0  0.1  1528  568 ?        S    Feb22   0:14 portmap
rpcuser    764  0.0  0.1  1616  688 ?        S    Feb22   0:26 rpc.statd
nscd      1022  0.0  0.2 13460 1188 ?        S    Feb22   0:00 /usr/sbin/nscd
nscd      1023  0.0  0.2 13460 1188 ?        S    Feb22   0:06 /usr/sbin/nscd
lp        1085  0.0  0.1  3300  904 ?        S    Feb22   0:00 lpd Waiting
root      1116  0.0  0.0  1780  512 ?        S    Feb22   0:00 rpc.rquotad
root      1121  0.0  0.2  2388 1488 ?        S    Feb22   0:01 rpc.mountd
root      1133  0.0  0.0     0    0 ?        SW   Feb22   1:38 [nfsd]
root      1134  0.0  0.0     0    0 ?        SW   Feb22   0:05 [lockd]
root      1135  0.0  0.0     0    0 ?        SW   Feb22   0:00 [rpciod]
root      1154  0.0  0.0  1660  392 ?        S    Feb22   0:00 rpc.yppasswdd
daemon    1341  0.0  0.0  1360  396 ?        S    Feb22   0:00 /usr/sbin/atd
leekent   1445  0.0  0.1 207812 876 ?        S    Feb22   0:00 /usr/java/j2re1
root      1575  0.0  0.1  1620  632 ?        S    Feb22   0:00 CROND
apache   23658  0.0  0.7 79480 3768 ?        S    Feb29   0:00 /usr/sbin/httpd
bmiller  24333  0.0  0.2  2540 1356 pts/0    S    Feb29   0:00 -bash
bmiller  24363  0.0  0.3  3016 1668 pts/0    S    Feb29   0:00 ssh turing
postgres 26952  0.0  0.7 15692 3680 ?        S    08:08   0:00 postgres:
bmiller  27979  0.4  0.2  2548 1384 pts/1    S    12:31   0:00 -bash
bmiller  28009  0.0  0.1  2564  640 pts/1    R    12:31   0:00 ps -aux
```

   (a) (2 points) How would you modify the command to show only the processes owned by the user bmiller?

   (b) (2 points) What command would you use to count the number of processes owned by root?

   (c) (2 points) What effect would the command `kill 1445` have if it was run by user postgres?

(d) (2 points) What effect would the command `kill 1445` have if it was run by user root?

(e) (2 points) Suppose you wanted to save the output from this command to a file, sorted by username. Show the command you would use to sort and write to a file.

2. (5 points) Rank the following functions in order from slowest growing to fastest.

- N
- $Nlog(N)$
- 10
- $log(N)$
- N^2

3. Using the following code fragment:

```
1 for(int i = 0; i<n;i++)
2     for(int j = 1; j <=n; j++)
3         for(int k = i; k<=j; k++)
4             sum++;
5 for( int p = 0; p < n*n; p++) {
6     for (int q = 0; q < p; q++) {
7         sum--;
```

(a) (4 points) Using Big-O notation, What is the worst case performance for the set of loops in lines 1–4?

(b) (4 points) Using Big-O notation, What is the worst case performance for the set of loops in lines 5–7?

(c) (4 points) Using Big-O notation, What is the overall worst case performance?

4. An algorithm takes 3.75 seconds for an input size of 100. How large of a problem can be solved in one minute if the algorithm is:

(a) (5 points) $O(N)$

(b) (5 points) $O(N^2)$

(c) (5 points) $O(log(N))$ Hint: $log_2(2^n) = n$

Make sure you show your work.

5. (5 points) What kind of data structure would you use to schedule jobs for a printer?

6. (5 points) What kind of data structure would you use to access information about books, using the library of congress call letters/numbers as the key.

7. For each of the following operations, tell which data structure provides the more efficient implementation (ArrayList of LinkedList). The two data structures may also be provide an equivalent implementation. Justify your answer.

   (a) (4 points) `addFirst(Object o)` : add object at the first position.

   (b) (4 points) `get(int id)` : fetch item at position id

   (c) (4 points) `getFirst()` : get the first element.

8. (10 points) Suppose you had a list of words stored in a HashSet. Write a fragment of Java code that would allow you to print out the words in alphabetical order.