Unix Tools
Courant Institute of Mathematical Sciences
Midterm Exam
March 11, 2008

Give a concise answer for each of the following questions.

1. Use `sort` to sort a tab-separated input file `foo.txt` according to the third column in reverse numerical order.

2. Write a `while` loop in `bash` that reads from stdin an input sequence and prints that sequence, and finishes if the length of that sequence is equal to the length of your last name.

3. Write a `bash` script that takes as arguments two strings x and y and changes filenames in the current directory by replacing a prefix x with the new prefix y, e.g., `foo1f.html` becomes `bar1f.html` if $x = foo1$ and $y = bar1$ (*hint*: you can use the parameter expansion functionalities available under bash and ksh such as `${#pattern}`).

4. Write a simple `ksh` script that sends by email to each user in `/etc/passswd` that is not yourself all of its arguments and sign it with your own first name and last name.

5. Use `find` to find all the files in the current directory that have been modified in the last twenty four hours or that have permission 666 and to make them unwritable to others.

6. The command `last` lists the users who logged on the system and other information as follows.

```
i5$ last | head -3
mxx2876    pts/11       207-237-206-5.c3 Sun Mar  19 23:11 - 23:17  (00:05)
mxx2876    sshd         207-237-206-5.c3 Sun Mar  19 23:11 - 23:12  (00:00)
troop75    pts/10       pool-70-107-167- Sun Mar  19 23:10 - 23:28  (00:18)
```

   Give a simple pipe using `last`, `cut`, `sort`, and `uniq` to list the users who logged on and the numbers of times each logged on, in decreasing order.

7. Use `egrep` to search for all lines of file `foo.txt` containing a word (sequence of letters separated by a space or newline character) of length four or more starting with the same two characters it is ending with.

8. Each line file `foo.txt` is a sequence of digits. Use `grep` to print the lines of file `foo.txt` with at most 3 digits or at least 7 digits.

9. The current directory contains a very large number of files. Write an `awk` script that prints the number of files owned by each user in this directory as well as the total number of bytes.

10. File `foo.c` contains function calls to f with at least four arguments, e.g., $f(x, y, z, t)$ or $f(x, y, z, t, u)$. Use `sed` to permute the first and last argument of f only when it is called with four arguments, e.g., $f(1, 2 * 3, 4 + 5, 6)$ becomes $f(6, 2 * 3, 4 + 5, 1)$.

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