Midterm 2–April 6

Open book section (36 points)

The exam is to be turned in at 1:50 pm. The closed book section should be turned in before you open your books and notes to work the open book section. For the open book section, write your answers on separate pieces of paper.

Problem 1. (15 points)

Suppose the following C program:

```
main(argc, argv)
int argc;
char *argv[];
{
int p[2], pid;
char c = 'x';
pipe(p);
pid=fork();
if (pid != 0)
{
c := 'y';
write(p[1], &c, 1);
close(p[1]);
read(p[0], &c, 1);
write(1, &c, 1);
kill(pid, SIGBUS);
wait(0);
}
else
{
read(p[0], &c, 1);
fork();
if (getpid()==pid)
c := 'z';
close(p[1]);
write(1, &c, 1);
}
}
```

is compiled and the compiled code is stored in the file `c190`. Describe what can happen if the command

```
% c190 hello world
```

is executed and all of the `fork` system calls work properly. (`getpid()` returns a processes own process id.) Merely "describing" the possible character(s) output on standard output does not constitute an adequate answer to this question.

Problem 2. (15 points)

We want to implement an anonymous suggestion box in Unix.

Every user will have file called `suggestions` stored in his or her home directory We want to create a program `suggest` such that whenever any user types the command:

```
% suggest smith daily.bathing
```

the file `daily.bathing` is appended to `smith`'s file `suggestions`. We want the system to work even if the `suggestions` file is read and write protected by its owner.

Describe how the features of the Unix operating system can be used to implement a single program `suggest` which will accomplish our goals. Be sure that your implementation of `suggest` does not introduce any security risks into the system.

Problem 3. (6 points)

A process checks for signals when it enters or leaves the sleep state (if it sleeps at an interruptible priority) and when it returns to user mode from the kernel after completion of a system call or after handling an interrupt. Why does the process not have to check for signals when entering the system for execution of a system call?

This problem is exercise 12 on page 241 of Bach's book.