CSc 360: Operating Systems (Summer 2015)

Written Assignment 1 (W1)

Due on: May 25, 2015, 5pm on connex

1. Most modern processors provide two modes of operation: user mode and kernel mode. Please answer the following questions concisely in a bullet point format.
   (a) What are the main differences between these two modes? [0.25]
   (b) From the viewpoint of operating systems, why are they needed? [0.25]
   (c) What are the main differences between mode switch and context switch? [0.25]
   (d) What are the pros and cons of micro-kernel structures in operating systems? [0.25]

2. In the following example, assume all system and library calls always complete with no error.

```
#define OUTPUT printf("%d\n", i)

main() {
  int i=0; OUTPUT;

  if (fork()) {
    i+=2; OUTPUT;
  } else {
    i++; OUTPUT; return(0);
  }
}
```

   (a) Please write down all possible outputs when running this program. [1]
   (b) Add one system call in the pseudo code to ensure that the output values are always in increasing order. [1]

3. Processes have three major states: running, blocked (also known as waiting), and ready. For each of the following state transitions, explain whether it is feasible: if feasible, give an example; if not, give reason. [2]
   (a) running-to-blocked
   (b) blocked-to-running
   (c) blocked-to-ready
   (d) ready-to-blocked
   (e) ready-to-running
   (f) running-to-ready