Homework 1

Due: 22 February 2023

Problem 1.1

The following example program is not exactly *useful* (and definitely doesn't always follow best coding practices) but it's illustrative of a variety of aspects of allocation. Draw a diagram of the stack and heap when the execution reaches the line marked XX. For all allocations, show both the allocated capacity and also the contents.

```
char* func (char* a, char* b, int num)
{
    char* local = strdup(b);
    char others[20] = "AARGHHH";

    local[3] = (char)('Q' + num);
    others[num] = '#';

    if (num <= 0)
        return a; // Line XX
    else
        return func(b, local, num - 1);
}

int main()
{
    char something[15] = "Howdy";
    char* stuff = malloc(10 * sizeof(char));
    strncat (stuff, "Longwood", 9);

    func (stuff, something, 2);
}
```

Problem 1.2

Draw diagrams of a reasonable overall process creation and communication patterns for each of the following programs. Briefly (one or two sentences) explain choices you made for each one.

a. a web browser with 2–4 tabs open

b. an editor that runs a compile command on the side without wanting to quit the editor first

c. a game with a user playing against an AI, which is responsive while the AI is "thinking" and also lets the AI use idle processor time to plan ahead while the user is thinking

Problem 1.3

Briefly discuss, for each of the following situations, which variety of IPC would be well-suited to the task, and why.

a. An editor program, when someone runs it to edit a file, wants to see if the user is already running the program, and if so, open the file in the already-running process (and exit the new additional one) rather than maintaining two separate processes side-by-side.

b. An always-running program, running in the background, wants specific programs (including some newly-written ones) to be able to notify it every time they run, with the user ID of whoever ran them.

Collaboration policy: group work! If you work with other people on this homework, hand in one copy and put all your names on top. There will be a revision cycle for this.