

Systems Programming Assignment 4 B07902129 何政勳

(a) 1. Parent process can retrieve the exit status of children.

2. Each child process will have unique process id before parent retrieving it.

(b) Copy-on-write reduces the time of copying all the data for the child process, and also reduces the usage of virtual memory.

(c) // strIntToInt is a function that transfers a string to an integer

```
pid_t double_fork(){
    int pfd[2];
    pid_t childPID;
    childPID = vfork();
    if (childPID == 0){
        pid_t grandChildPID;
        grandChildPID = fork();
        if (grandChildPID == 0){
            // grand child
            close(pfd[0]);
            close(pfd[1]);
        }
        else {
            char buf[16];
            sprintf(buf, "%d", grandChildPID);
            write(pfd[1], buf, strlen(buf));
            close(pfd[1]);
            return 0;
        }
    }
    else {
        char buf[16];
        int status;
        pid_t grandChildPID;
        read(pfd[0], buf, 16);
        grandChildPID = strIntToInt(buf);
        close(pfd[0]);
        return grandChildPID;
    }
}
```