

```
M11212913@telnet:~/hw9$ clear
M11212913@telnet:~/hw9$ ls -l
total 4
-rw-r--r-- 1 M11212913 telnet 1786 2024-12-07 15:45 main.c
M11212913@telnet:~/hw9$ more main.c
#include <stdio.h>
#include <stdlib.h>
#include <unistd.h>
#include <fcntl.h>
#include <sys/wait.h>

#define ERR (-1)
#define READ 0 // pipe read
#define WRITE 1 // pipe write
#define STDIN 0
#define STDOUT 1

int main(void) {
    int pid_1, pid_2, pid_3;
    int pfd_1[2], pfd_2[2];

    // pipe1
    if (pipe(pfd_1) == ERR) {
        perror("pfd_1 failed");
        exit(ERR);
    }

    if ((pid_1 = fork()) == ERR) {
        perror("fork1 failed");
        exit(ERR);
    }

    // 1st child: ps aux
    if (pid_1 == 0) {
        close(STDOUT);
        dup(pfd_1[WRITE]);
        close(pfd_1[READ]);
        close(pfd_1[WRITE]);

        execlp("ps", "ps", "aux", (char *)NULL);
        perror("1st child execlp failed");
        exit(ERR);
    }

    --More--(36%)
```

```
// pipe2
if (pipe(pfd_2) == ERR) {
    perror("pfd_2 failed");
    exit(ERR);
}

if ((pid_2 = fork()) == ERR) {
    perror("fork2 failed");
    exit(ERR);
}

// 2nd child grep
if (pid_2 == 0) {
    close(STDIN);
    dup(pfd_1[READ]);
    close(STDOUT);
    dup(pfd_2[WRITE]);
    close(pfd_1[READ]);
    close(pfd_1[WRITE]);
    close(pfd_2[READ]);
    close(pfd_2[WRITE]);

    execlp("grep", "grep", "M11212913", (char *)NULL);
    perror("2nd child execlp failed");
    exit(ERR);
}

if((pid_3 = fork()) == ERR) {
    perror("fork3 failed");
    exit(ERR);
}

if(pid_3 == 0) {
    close(STDIN);
    dup(pfd_2[READ]);
    close(pfd_1[READ]);
    close(pfd_1[WRITE]);
    close(pfd_2[READ]);
    close(pfd_2[WRITE]);

    int fd1 = open("the_result", O_WRONLY | O_CREAT | O_TRUNC, 0644);
    if (fd1 == ERR) {
        perror("open file failed");
    }
}
```

--More--(82%)

```
M11212913@telnet: ~/hw9  ×  +  v

        exit(ERR);
    }

    if((pid_3 = fork()) == ERR) {
        perror("fork3 failed");
        exit(ERR);
    }

    if(pid_3 == 0) {
        close(STDIN);
        dup(pfd_2[READ]);
        close(pfd_1[READ]);
        close(pfd_1[WRITE]);
        close(pfd_2[READ]);
        close(pfd_2[WRITE]);

        int fd1 = open("the_result", O_WRONLY | O_CREAT | O_TRUNC, 0644);
        if (fd1 == ERR) {
            perror("open file failed");
            exit(ERR);
        }

        close(STDOUT);
        dup(fd1);
        close(fd1);

        execlp("wc", "wc", (char *)NULL);
        perror("3rd child execlp failed");
        exit(ERR);
    }

    // parent ex
    close(pfd_1[READ]);
    close(pfd_1[WRITE]);
    close(pfd_2[READ]);
    close(pfd_2[WRITE]);

    wait(NULL);
    wait(NULL);
    wait(NULL);

    return 0;
}

M11212913@telnet:~/hw9$
```

[more main.c](#)

```
M11212913@telnet:~/hw9$ gcc main.c
M11212913@telnet:~/hw9$ ls -l
total 12
-rwxr-xr-x 1 M11212913 telnet 7378 2024-12-07 15:48 a.out
-rw-r--r-- 1 M11212913 telnet 1786 2024-12-07 15:45 main.c
M11212913@telnet:~/hw9$ ./a.out
M11212913@telnet:~/hw9$ ls -l
total 16
-rwxr-xr-x 1 M11212913 telnet 7378 2024-12-07 15:48 a.out
-rw-r--r-- 1 M11212913 telnet 1786 2024-12-07 15:45 main.c
-rw-r--r-- 1 M11212913 telnet 24 2024-12-07 15:48 the_result
M11212913@telnet:~/hw9$ more the_result
      5      62     430
M11212913@telnet:~/hw9$
```