**Department of Computer Science**
**The University of Hong Kong**
**COMP3230B: Principles of Operating Systems**
**Sample Solution of Assignment 1**

## Task 1-2 Programming

Please refer to *tmem_sample.c* for details.

## Task 3 Analysis

a) Two new processes are created. Denote the parent process as P0, the child from the first fork() call as P1, and the child from the second call as P2.

At the end of the program, all 3 processes have different values of variable *c*.

P0: 20

P1: 5

P2: 15

There are 3 copies.

b) The vmdata and vmsize curves go up and down, because memories in heap are allocated and released periodically.

The vmstk and vmrss curves are quite stable. RSS does not always decrease when the memory in heap is freed, because if no other process is requiring more physical memory. From the kernel's point of view, it only records which frames belong to which processes.

c) This question is based on Copy-on-Write.

The child process has a duplicated virtual memory space, so vmsize, vmdata and vmstk remain the same.

The null_data buffer has been accessed by the parent process before the fork() call. When the child tries to modify the buffer, another physical copy is allocated, so VMRSS increases.