Question

Assume several threads are created using the many-to-one threading model. Discuss whether they can execute concurrently, in parallel or both.

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Question

What is the pthread_join function used for? Write a small sample code to support your discussion.

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Question

Explain why concurrent and parallel execution can be achieved by a program by means of both multiple processes and multiple threads.

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Question

(4 p) Is the sentence printed by this code true or false? Discuss why.

```
int main() {
   pid_t pid1, pid2, pid3;
   pid1 = getpid();
   pid2 = fork();
   pid3 = getpid();
   if (pid3==pid1) {
      printf("I am the child process");
   }
}
```

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Question

(c) (4 p) What is printed by the following program? Explain why, assuming the fork is successful.

```
1
2  int a[5] = {0,1,2,3,4};
3
4  int main()
5  {
6
7     int b[5] = {5,6,7,8,9};
8
9     pid_t pid;
10
11    for (int i=0;i<5;i++)
12       a[i]*=2;
13    for (int i=0;i<5;i++)
14       b[i]*=2;
15
16    pid = fork();
17
18    if (pid == 0) {
19       for (int i=0;i<5;i++)
20          a[i]*=2;
21    }
22    else {
23       wait(NULL);
24       for (int i=0;i<5;i++)
25          printf('%d ',a[i]);
26       for (int i=0;i<5;i++)
27          printf('%d ',b[i]);
28    }
29
30  return 0;
31 }
```