Numerical Simulation and Scientific Computing

Exercice 3: Task 3

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After implementing the entire algorithm, here's the benchmark result. You can see how long it takes to integrate the 3 functions as a function of the number of threads:

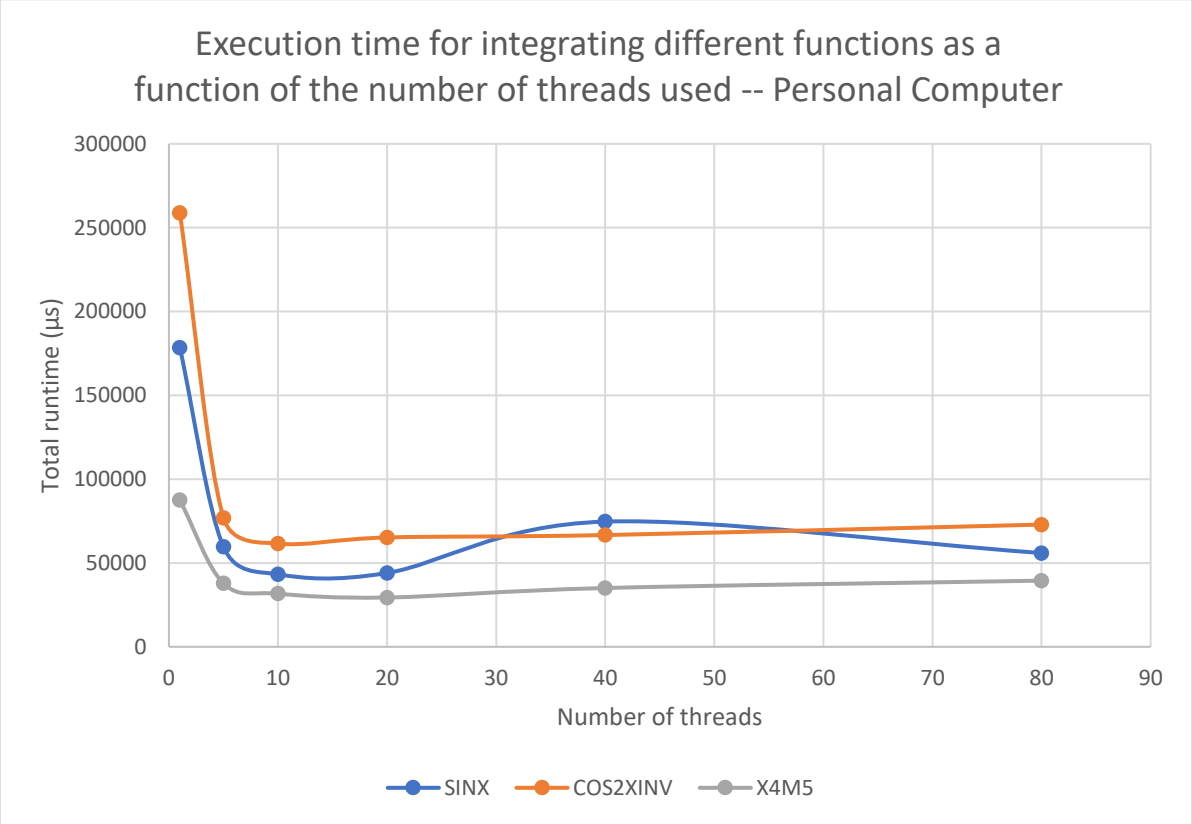

Figure 1: benchmark on my personal computer

We've noticed something very interesting: execution time is not directly inversely proportional to the number of threads. In fact, the optimal number of threads seems to be around 10. This is due to the hardware limitations of my computer. Indeed, my computer has 12 logical processors, so having a much larger number of threads than that won't improve performance, as a bottleneck will be created. So, beyond a certain threshold (higher than the number of logic cores), maximum efficiency will be capped, regardless of the number of threads.

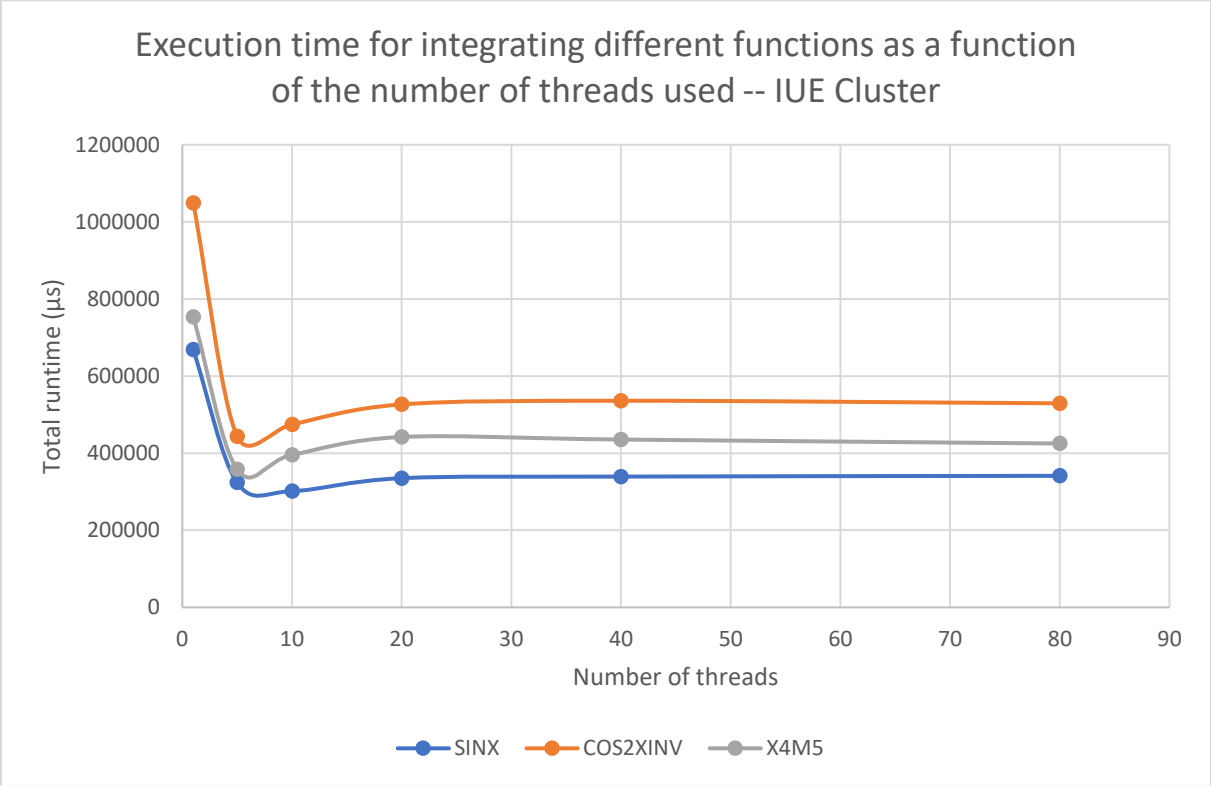

Figure 2: benchmark on the IUE cluster

The same pattern can be seen as on the personal computer. The division into a certain number of threads is optimal when there are as many threads as there are logical processors. Given that in the submission script, I didn't specify the number of cores the cluster should use we can deduce that around 6 logic cores were used, which corresponds to an optimal number of threads, and therefore optimal execution performance.