

# 360.242 Numerical Simulation and Scientific Computing I, 2024W

## Exercise #3: Task 3

Group 05

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### 3 Monte Carlo Integration

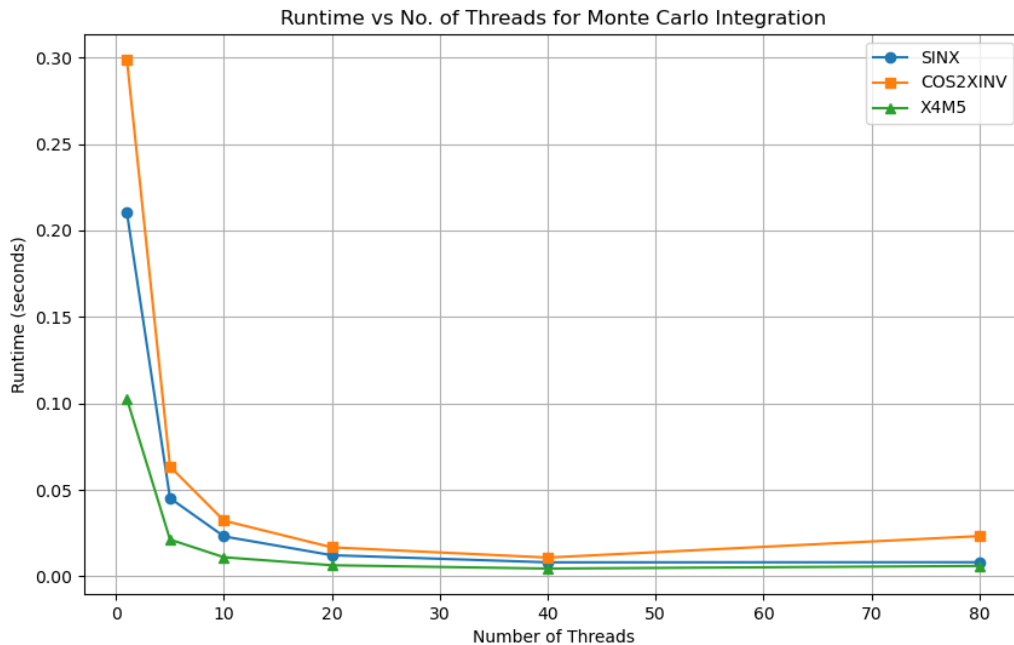


Figure 1: Plot of runtime for 1, 5, 10, 20, 40, and 80 threads when using  $XMIN = -\pi/2$ ,  $XMAX = \pi/2$ , for each of the three functions and 10 million samples.

## Build and Run

1. **make clean:** cleans up generated files
2. **make serial:** compiles code defined in `main.cpp` as a serial programme
3. **make parallel:** compiles code defined in `main.cpp` as a parallel programme
4. **make sinx:** runs a test using the  $\sin(x)$  function in the domain  $(-\pi/2, \pi/2)$ , equivalent to running:

Command Line

```
$ OMP_NUM_THREADS=4 ./mcint SINX -1.570796326794897  
1.570796326794897 10000000
```

5. **make cos2xinv:** runs a test using the  $\cos^2(1/x)$  function in the domain  $(-\pi/2, \pi/2)$ , equivalent to running:

Command Line

```
$ OMP_NUM_THREADS=4 ./mcint COS2XINV -1.570796326794897  
1.570796326794897 10000000
```

6. **make x4m5:** runs a test using the  $5x^4$  function in the domain  $(-\pi/2, \pi/2)$ , equivalent to running:

Command Line

```
$ OMP_NUM_THREADS=4 ./mcint X4M5 -1.570796326794897  
1.570796326794897 10000000
```