Monte Carlo, Exercise Session 3

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1 Exercise 1

Code: Ex1.cpp. Answer: Figure 1.

Figure 1: Ex1 answer.

Result makes sense, since the correct answers are 2, π, $4*\pi/3$ ...

2 Exercise 2

Answer presented in Figure 2.


```
Exercise 2
N: 1, Volyymi: 1.96099+-0.058554
N: 2, Volyymi: 3.09459+-0.0454919
N: 3, Volyymi: 4.11248+-0.0966952
N: 4, Volyymi: 4.81752+-0.149956
N: 5, Volyymi: 5.10814+-0.196707
```

Figure 2: Ex2 answer.

Result in Exercise 1 and Exercise 2 are pretty similar. However the sampling method requires significantly more time, so had to increase binning, which increased the uncertainty.

3 Exercise 3

Answer presented in Figure 3.


```
Exercise 3
HM
N=10^2, delta I: 0.003002910 ,Time: 0.000200000 sec
N=10^3, delta I: -0.041997090 ,Time: 0.001041000 sec
N=10^4, delta I: 0.026502910 ,Time: 0.008813000 sec
N=10^5, delta I: 0.000302910 ,Time: 0.067871000 sec
N=10^6, delta I: -0.000047090 ,Time: 0.679489000 sec
DS
N=10^2, delta I: 0.026515182 ,Time: 0.000067000 sec
N=10^3, delta I: 0.047064267 ,Time: 0.000653000 sec
N=10^4, delta I: 0.003453047 ,Time: 0.006505000 sec
N=10^5, delta I: -0.005294656 ,Time: 0.065005000 sec
N=10^6, delta I: -0.001357247 ,Time: 0.648338000 sec
SS
N=10^2, delta I: 0.103002910 ,Time: 0.000098000 sec
N=10^3, delta I: 0.015541932 ,Time: 0.000773000 sec
N=10^4, delta I: 0.001002910 ,Time: 0.007859000 sec
N=10^5, delta I: 0.000166826 ,Time: 0.076617000 sec
N=10^6, delta I: -0.000007090 ,Time: 0.761908000 sec
PSS
N=10^2, delta I: 0.053002910 ,Time: 0.000086000 sec
N=10^3, delta I: -0.006997090 ,Time: 0.000606000 sec
N=10^4, delta I: 0.006502910 ,Time: 0.005838000 sec
N=10^5, delta I: 0.009652910 ,Time: 0.059029000 sec
N=10^6, delta I: 0.000437910 ,Time: 0.583344000 sec
End!

Process returned 0 (0x0)   execution time : 2.982 s
Press ENTER to continue.
```

Figure 3: Ex3 answer.

The increase of N looks like increasing the precision of the result.

The strange peak is observed in PSS at N $=10^5$, which suggests that the N is not big enough.

Time increase is as predictable, N multiplication by 10 increases time nearly 10 times.