Sheet 3 - Answers

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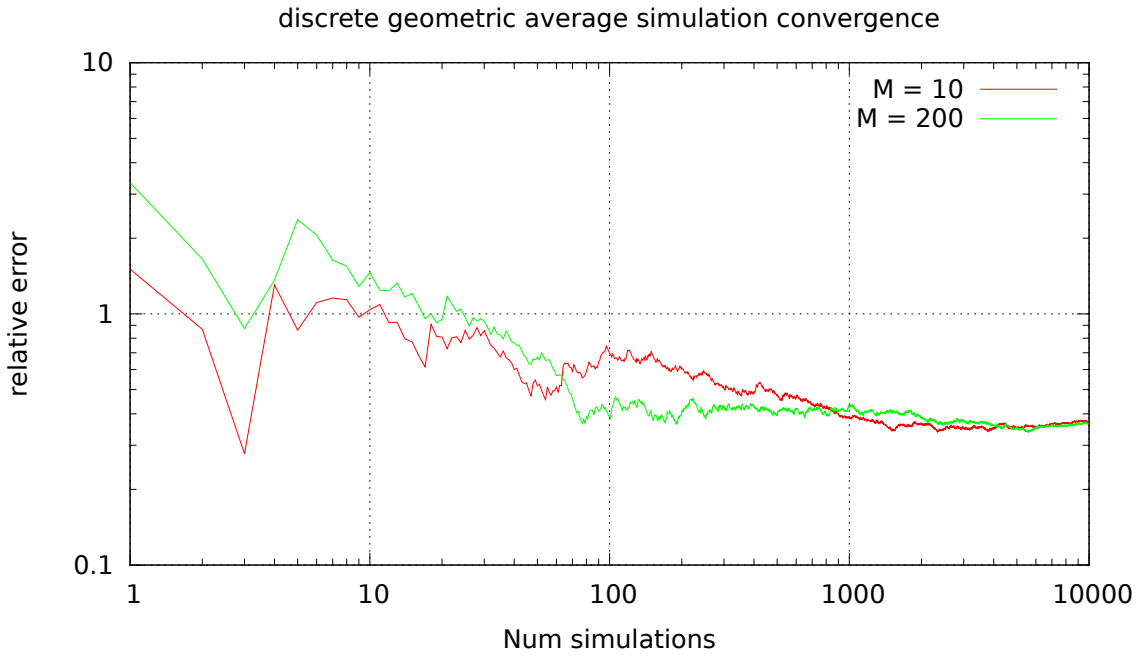
June 2, 2014

Task: 1

Wird vielleicht noch nachgereicht, falls ich den Beweis noch hinkriege.
Momentaner Ansatz befindet sich im Ordner BaSheet03/Task01.
Timm

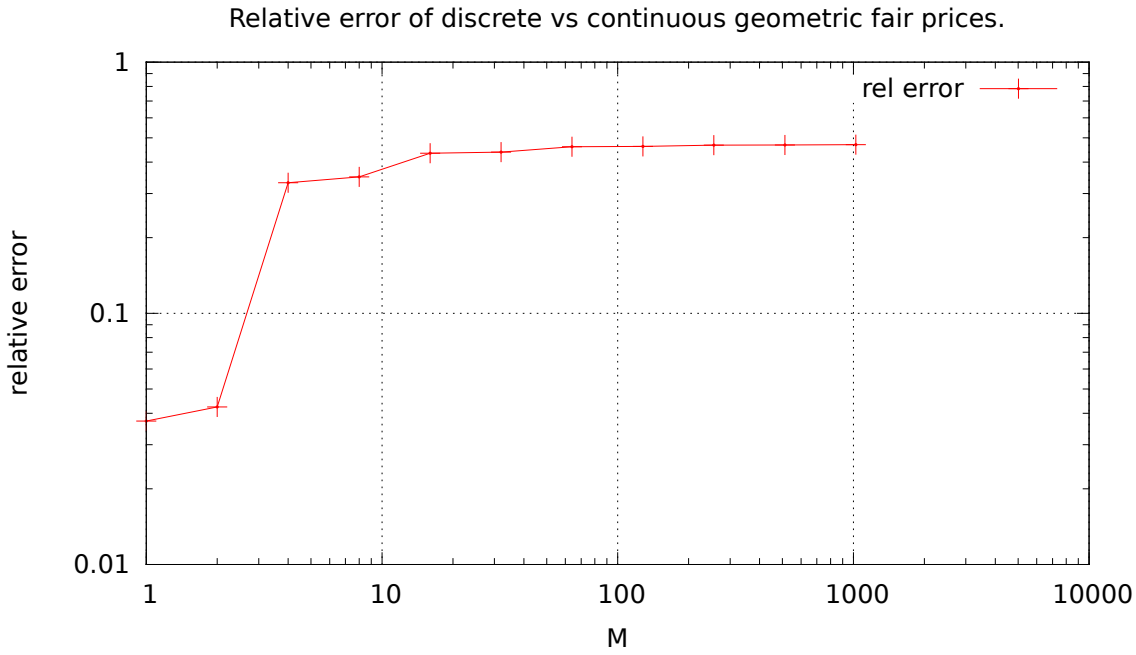
Task: 3

We assume that the convergence should go to zero. This is maybe connected to the fact that our implementation of the closed solution differs from the closed solution is given by the side "http://www.quantcalc.net/DGA.html" but our simulation doesn't converge either way.

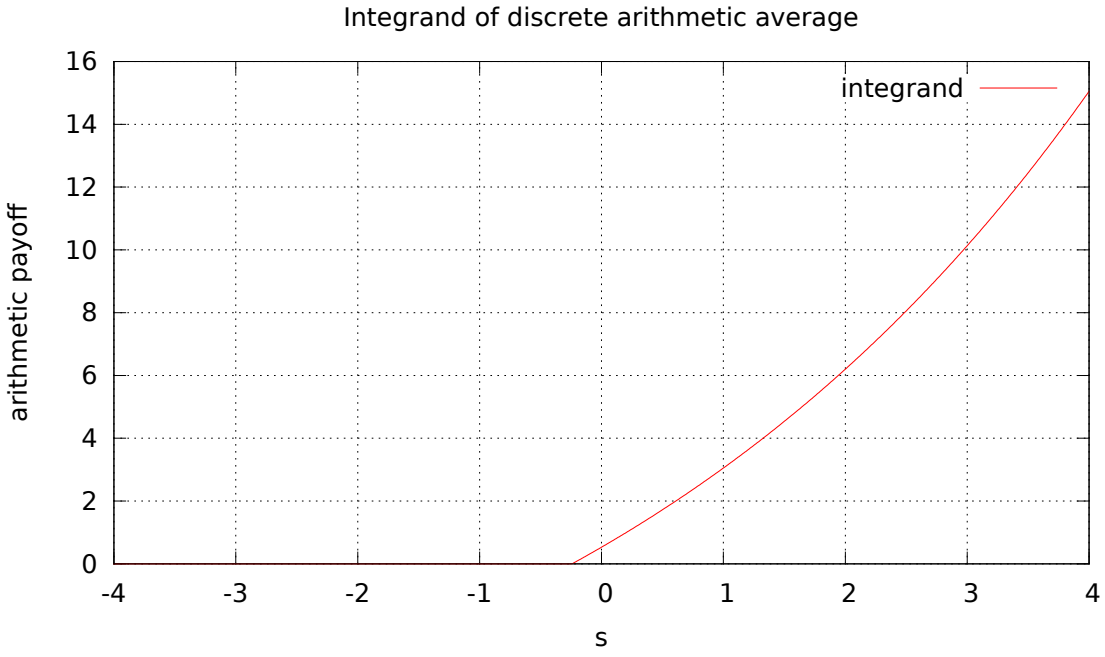


This behavior is not desired. We would expect the error getting smaler, but this is maybe connected to behavior in task 3.

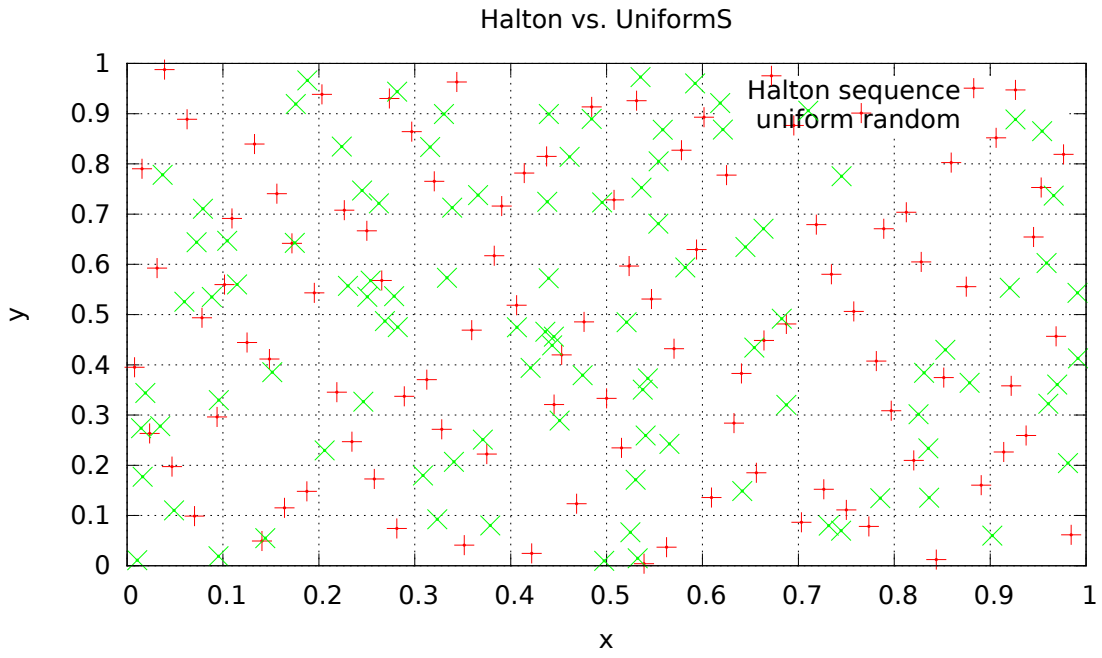
Task: 4



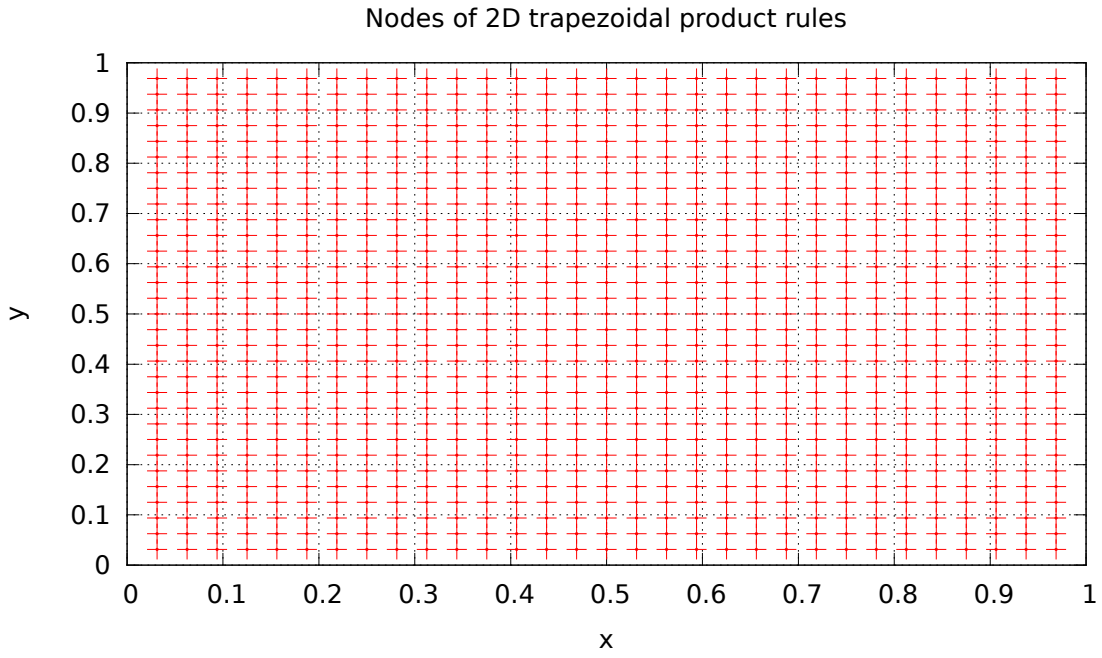
Task: 5

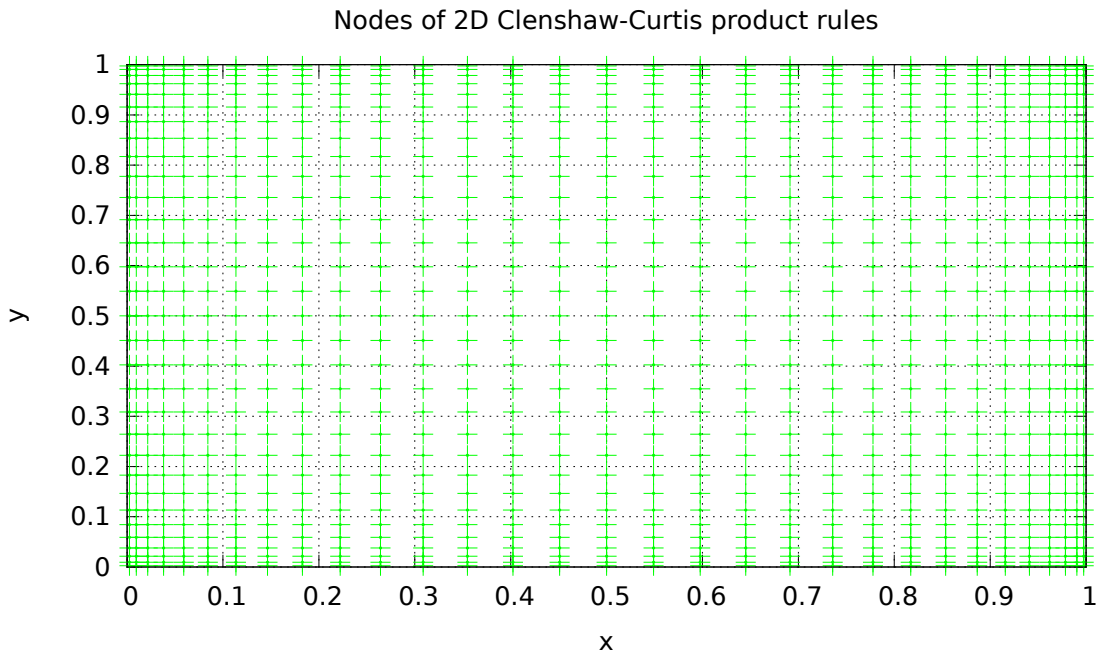


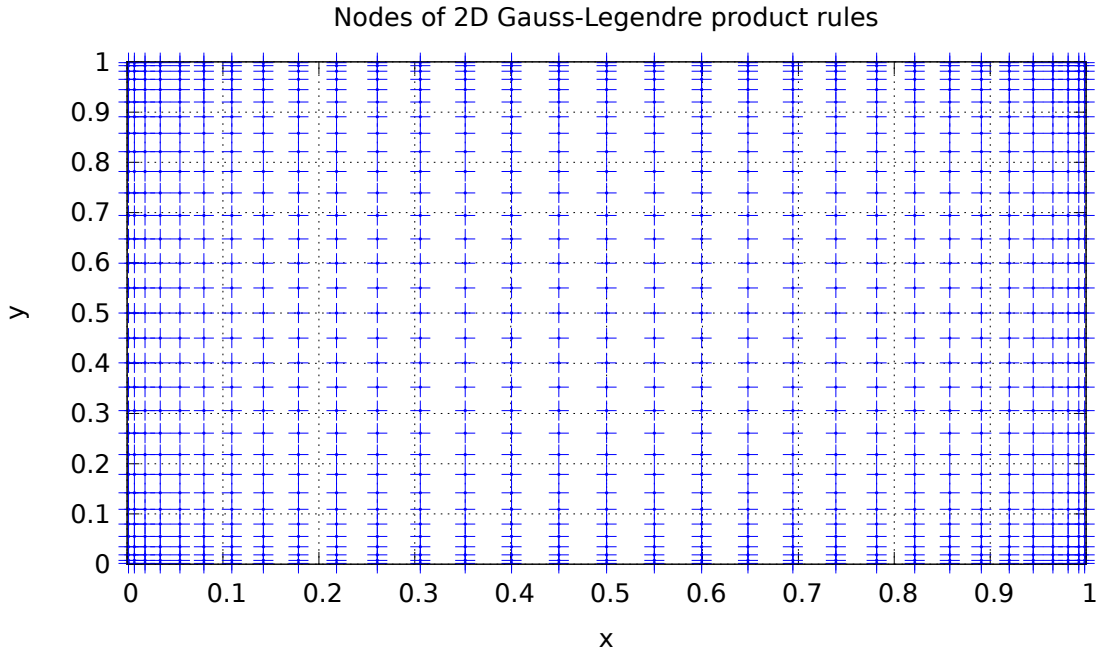
Task: 7


Halton vs. UniformS
Halton sequence
uniform random
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

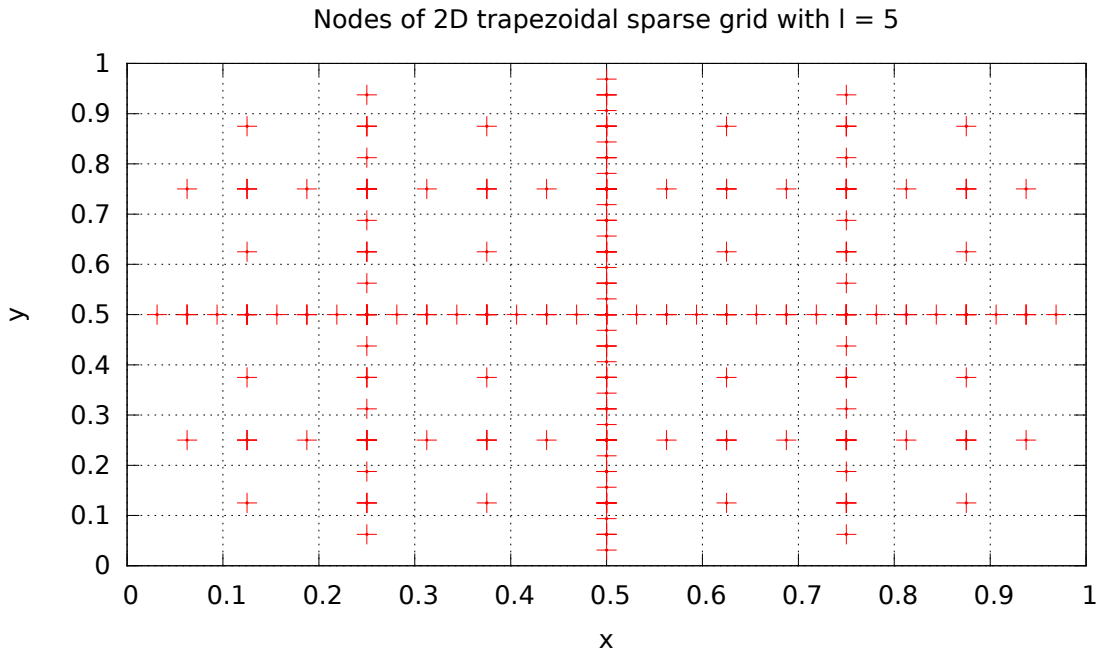
Task: 9

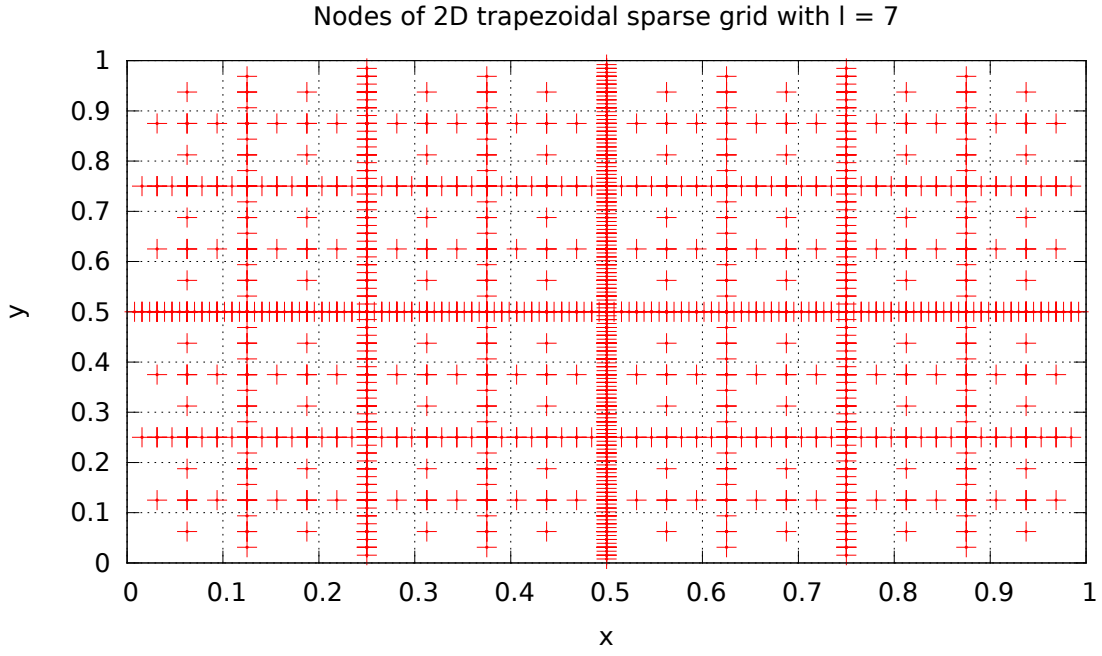

Nodes of 2D trapezoidal product rules
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

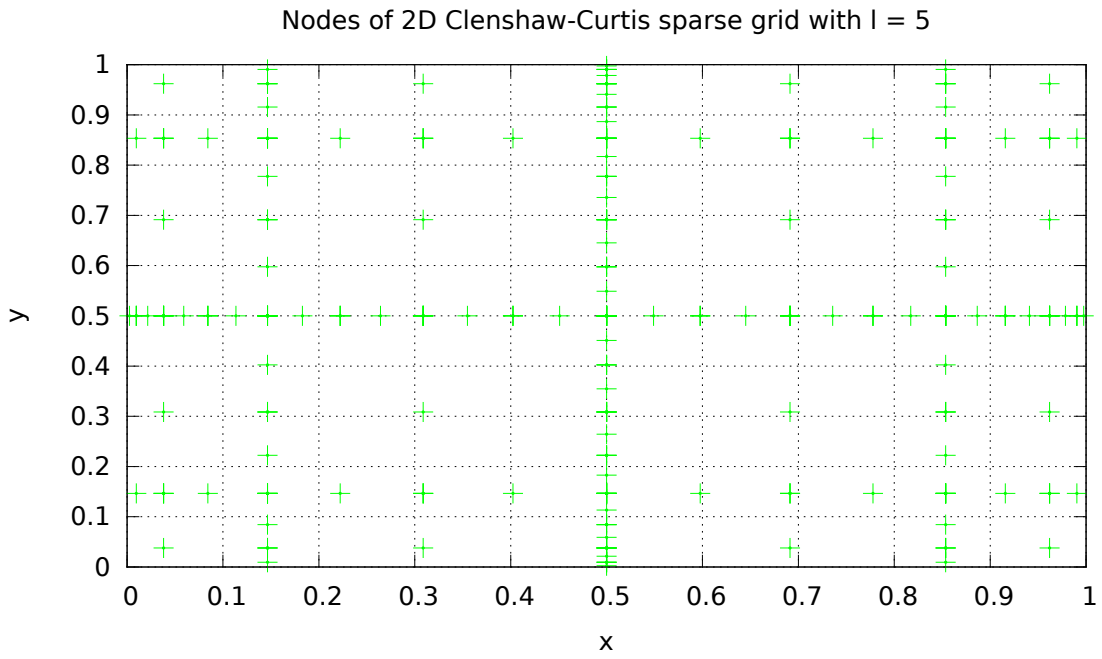

Nodes of 2D Clenshaw-Curtis product rules
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

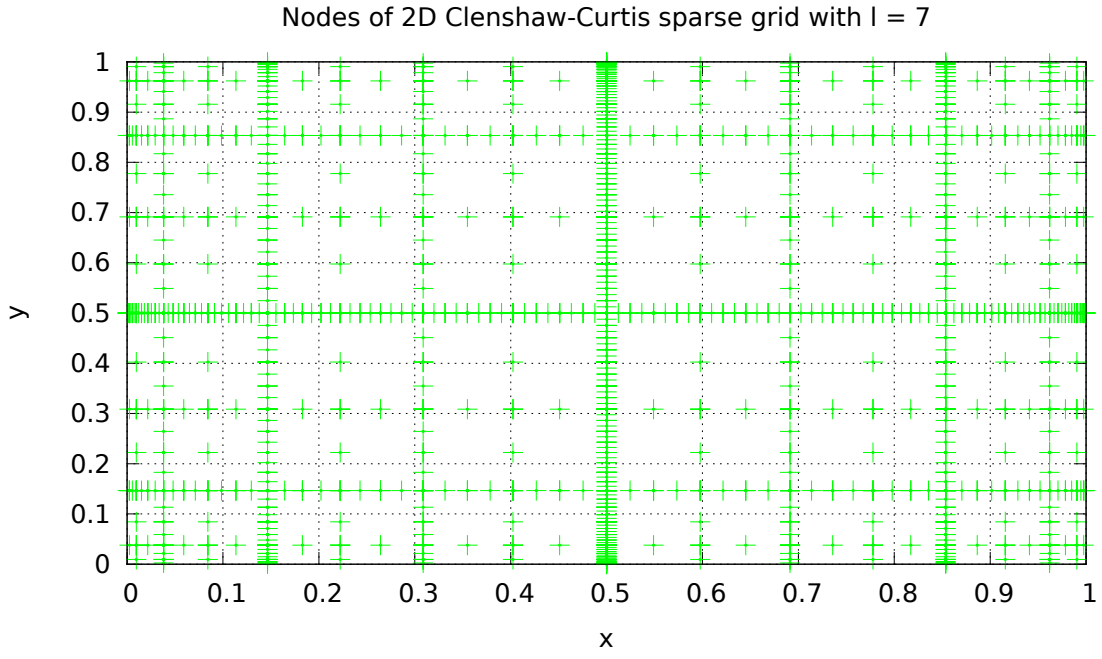

Nodes of 2D Gauss-Legendre product rules
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Task: 11

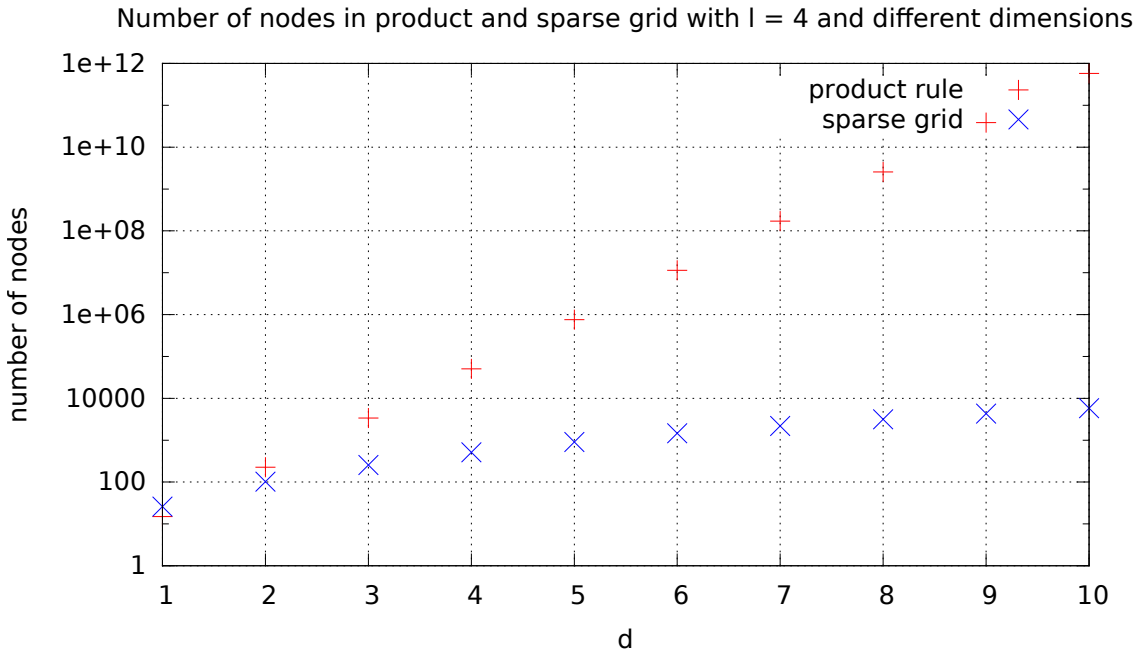

Nodes of 2D trapezoidal sparse grid with l = 5
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Nodes of 2D trapezoidal sparse grid with l = 7
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

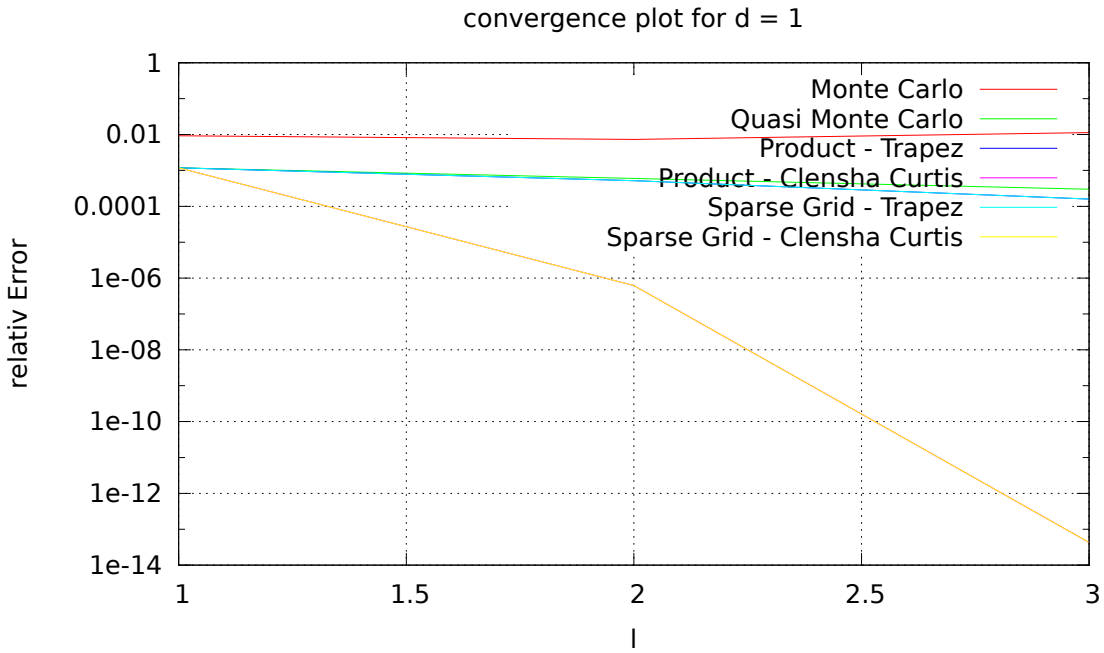

Nodes of 2D Clenshaw-Curtis sparse grid with l = 5
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

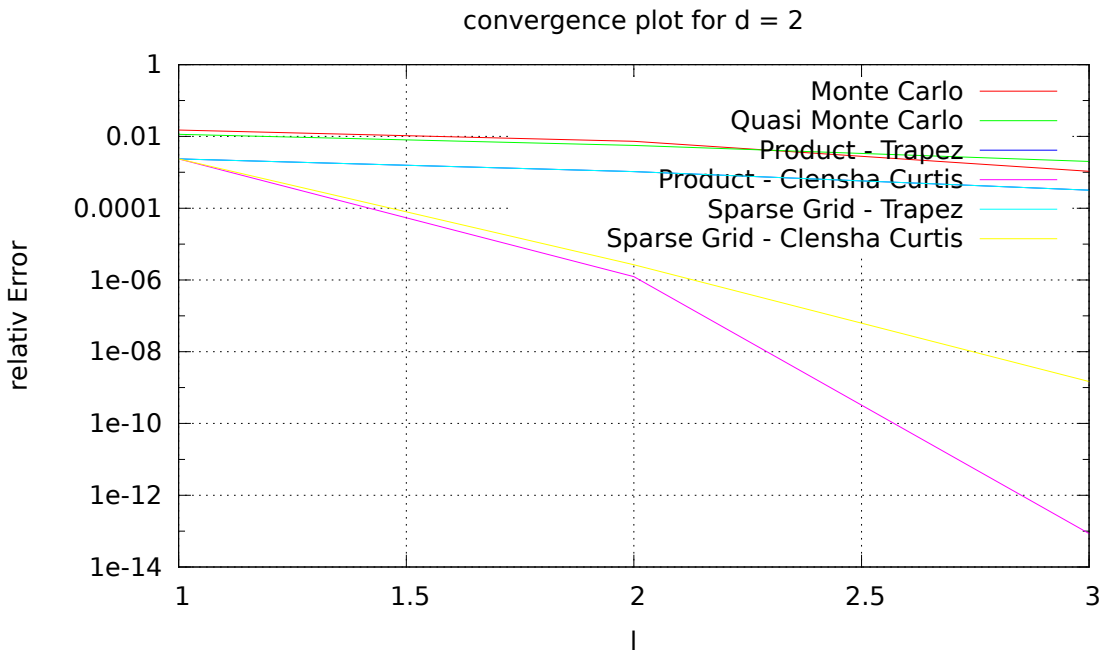

Nodes of 2D Clenshaw-Curtis sparse grid with l = 7
y
x
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

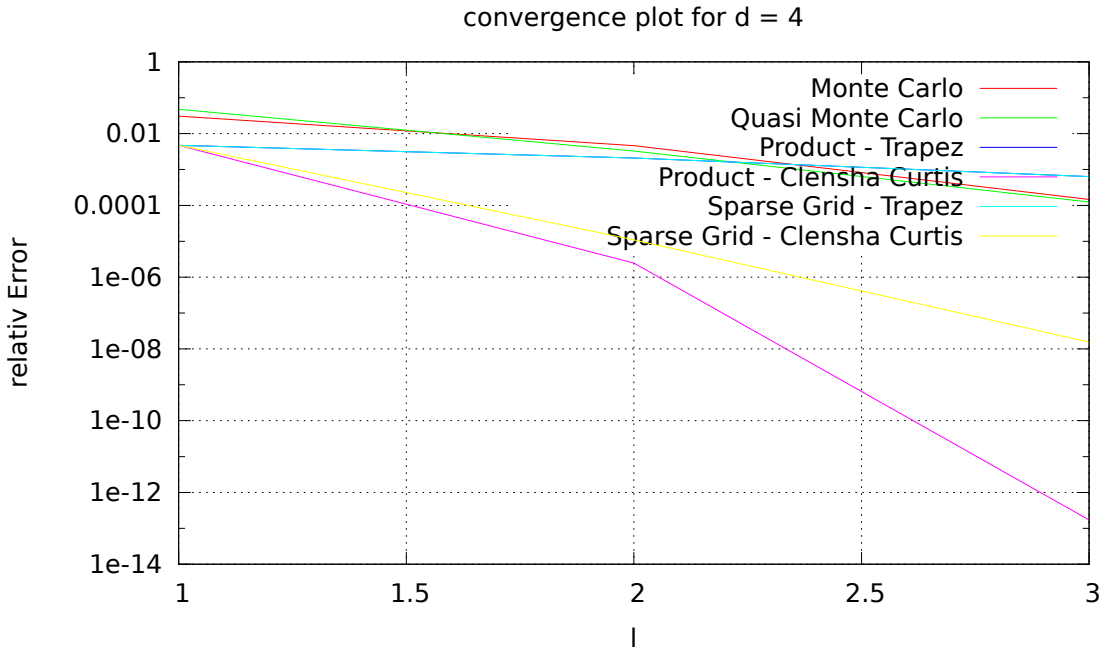
Task: 12

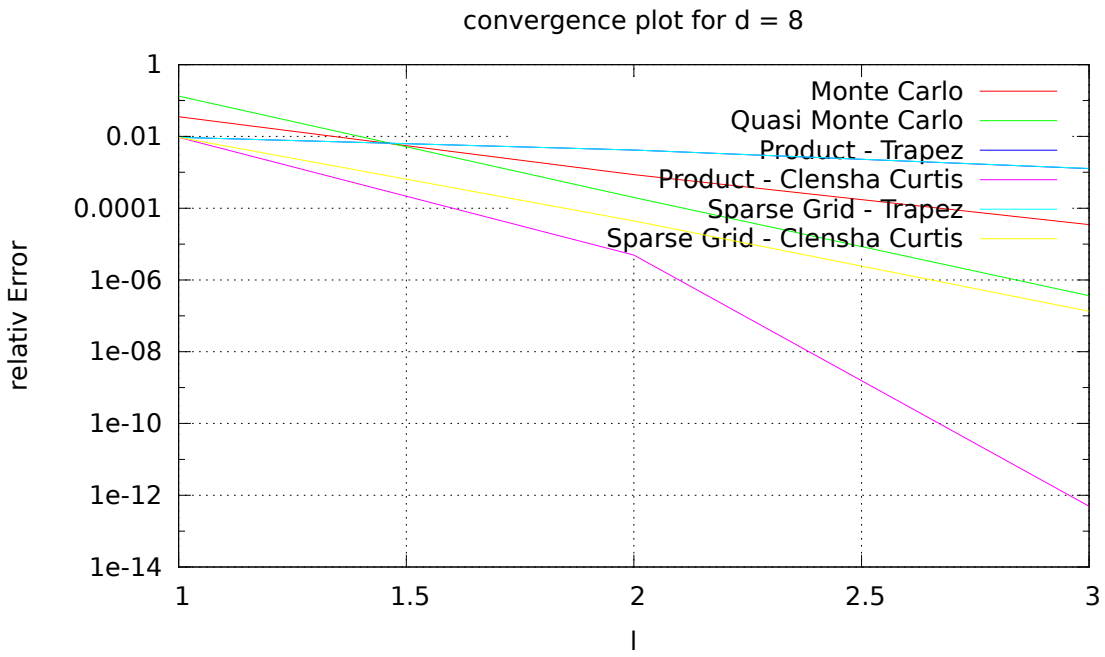


Task: 13




convergence plot for d = 2
relativ Error
1
0.01
0.0001
1e-06
1e-08
1e-10
1e-12
1e-14
1
1.5
2
2.5
3
l
Monte Carlo
Quasi Monte Carlo
Product - Trapez
Product - Clensha Curtis
Sparse Grid - Trapez
Sparse Grid - Clensha Curtis

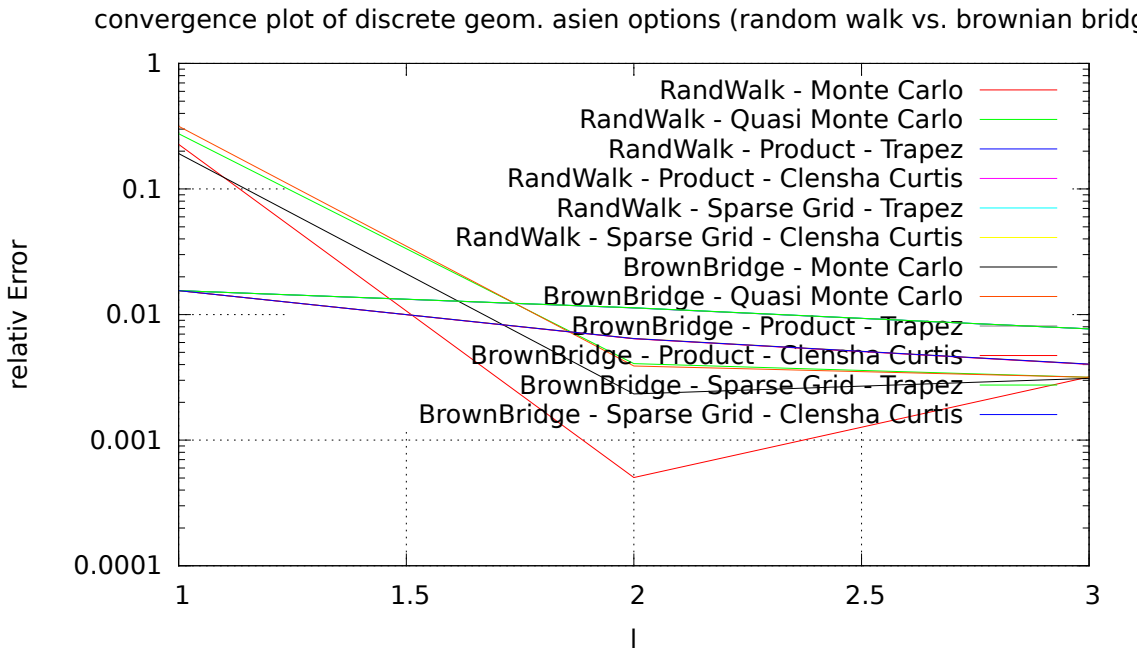

convergence plot for d = 4
relativ Error
1
0.01
0.0001
1e-06
1e-08
1e-10
1e-12
1e-14
1
1.5
2
2.5
3
l
Monte Carlo
Quasi Monte Carlo
Product - Trapez
Product - Clensha Curtis
Sparse Grid - Trapez
Sparse Grid - Clensha Curtis



Task: 15

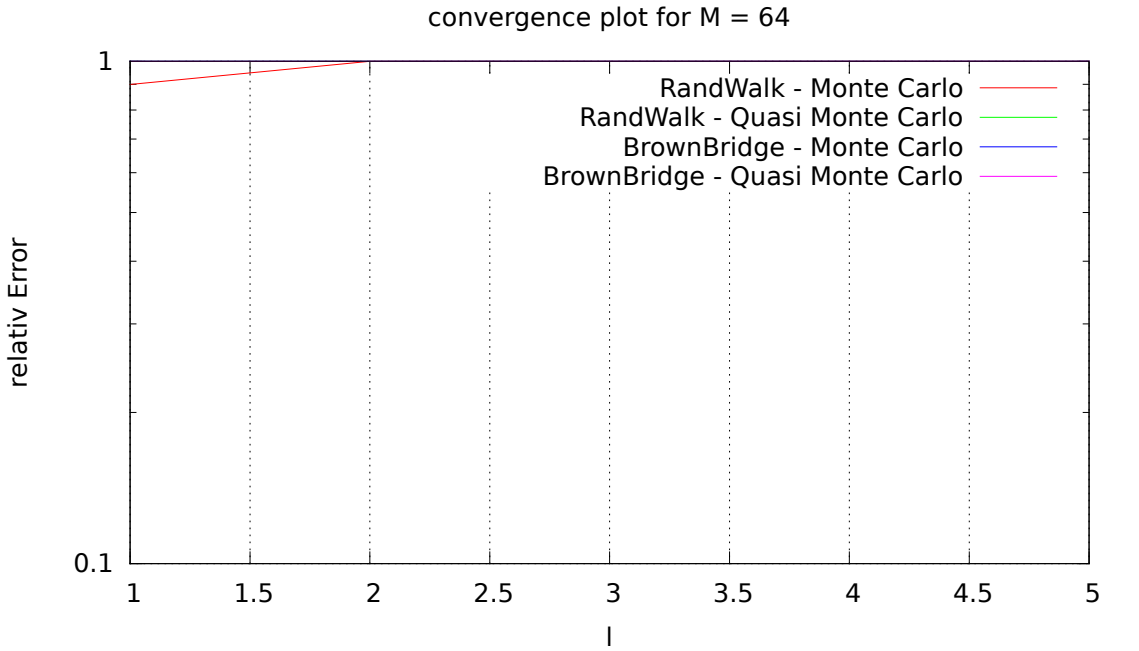
With level 4 and the given values the integration of both simulations is 10.4889.

Task: 16



Task: 17

We can't explait this behavior, but we are aware of its wrong nature :)



Task: 18

Because of the impact of the dimension into the convergence rate, the product rule should be used for low dimensions, the sparse grid can be used for higher dimensions, then quasi Monte Carlo and for any high dimension the Monte Carlo integration method whichs convergence rate does not depend on the dimension.