Assignment – 5 Integration(II)

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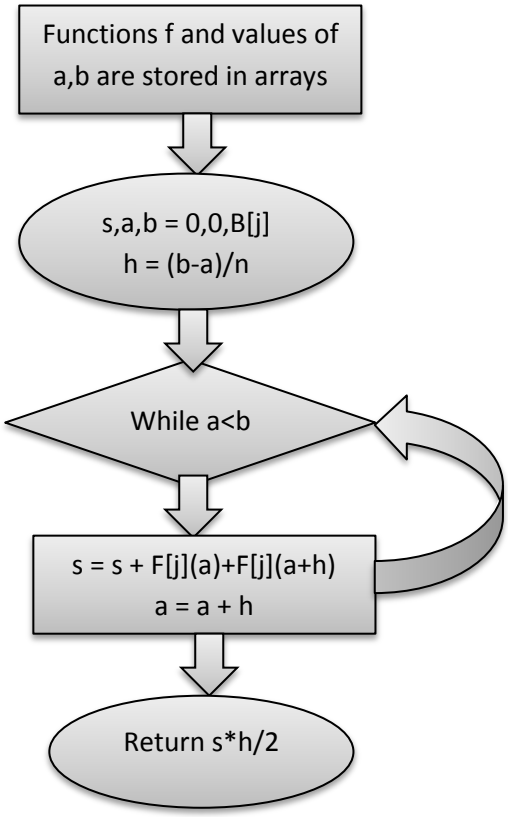
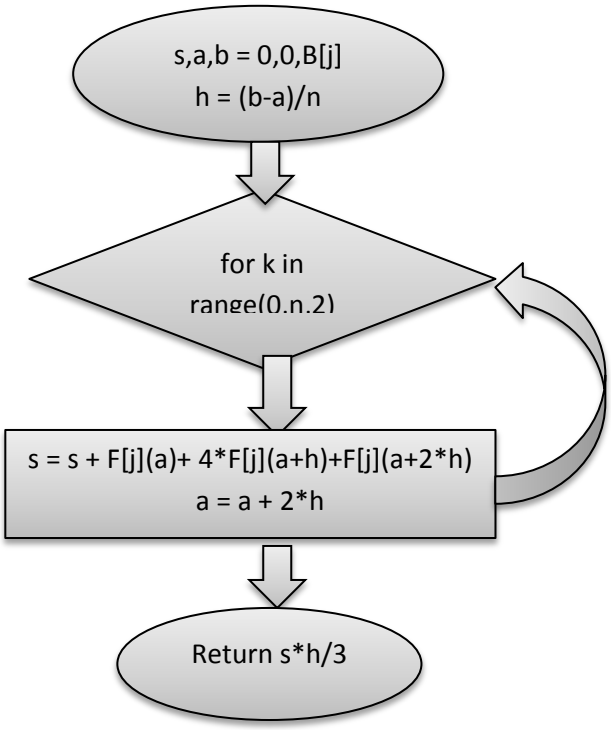
Problem – 1

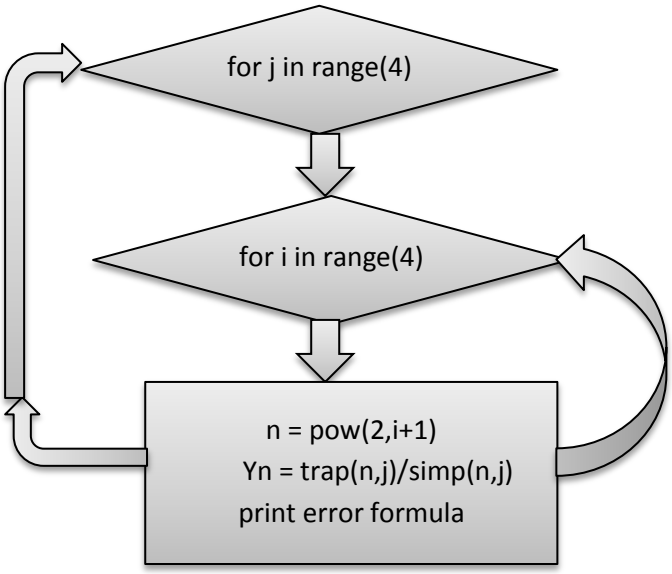
Method :

Function defined for trapezoidal method



Function defined for simpson method





Results :

Error(using trapazoidal) with n

2 0.0
4 0.0
8 0.0
16 0.0
32 0.0
64 0.0
128 0.0
256 0.0
512 0.0
1024 0.0

2 0.12500000000000006
4 0.031250000000000056
8 0.007812500000000056
16 0.0019531250000000555
32 0.0004882812500000555
64 0.0001220703125000555
128 3.051757812505551e-05
256 7.629394531305511e-06
512 1.907348632868011e-06
1024 4.768371582586362e-07

2 0.21460183660255172
4 0.05194055103147999
8 0.012884199027224597
16 0.003214828113830892
32 0.0008033195149284023
64 0.0008029566377771857
128 0.00020078300015713424
256 5.0198490406772045e-05
512 3.1374647171400483e-06
1024 3.1374591815680475e-06

2 0.21460183660255155
4 0.05194055103148006
8 0.012884199027224548
16 0.0032148281138306262
32 0.0008033195149283065
64 0.0014239248130037266
128 0.000353718953233301
256 8.814122809163585e-05
512 3.1374647236920815e-06
1024 5.495148425122328e-06

Error(using simpson) with n

2 0.0
4 0.0
8 0.0
16 0.0
32 0.0
64 0.0
128 0.0
256 0.0
512 0.0
1024 0.0

2 0.0
4 0.0
8 0.0
16 0.0
32 0.0
64 0.0
128 0.0
256 0.0
512 0.0

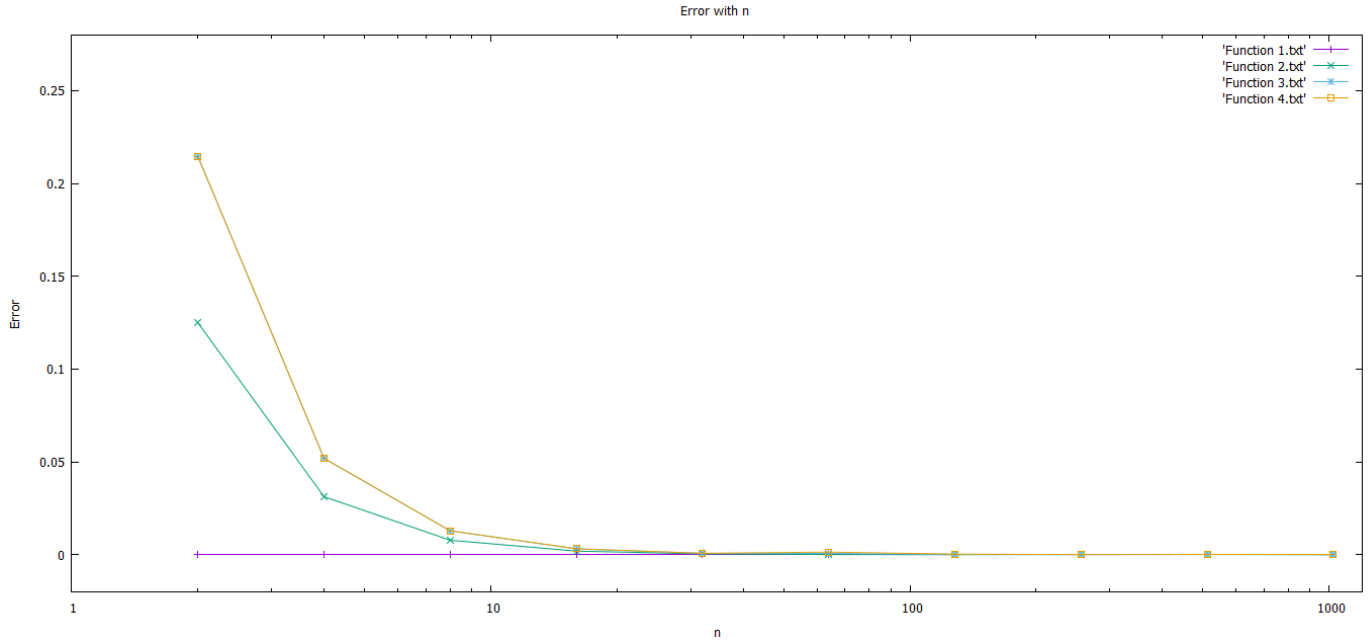
1024 0.0

2 0.04719755119659763
4 0.0022798774922103693
8 0.0001345849741940519
16 8.295523967749574e-06
32 5.166847063531321e-07
64 3.2265000227127416e-08
128 2.0161294855824963e-09
256 1.2600387400141244e-10
512 7.878364627345036e-12
1024 4.842792833414933e-13

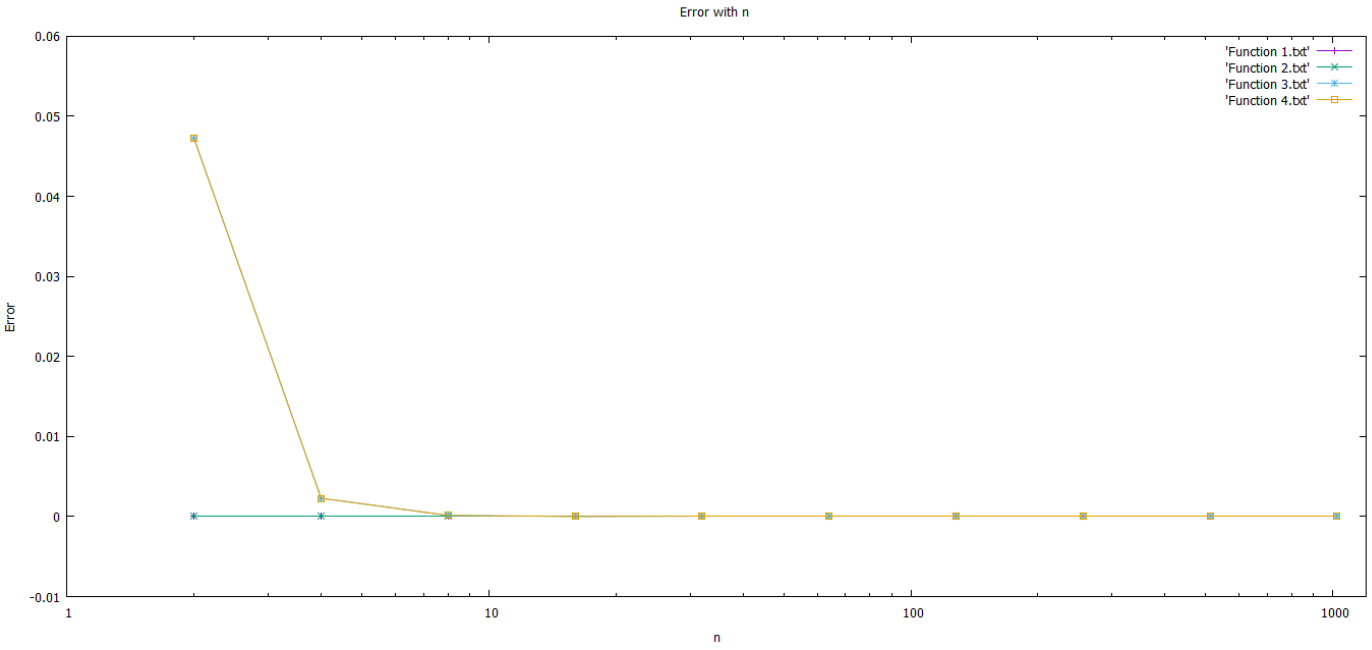
2 0.04719755119659777
4 0.002279877492210437
8 0.0001345849741940045
16 8.295523967960085e-06
32 5.166847062712779e-07
64 3.2265000272934336e-08
128 2.0161300057960874e-09
256 1.2600311598863215e-10
512 7.876325613176253e-12
1024 4.777899921487416e-13

Graphs :

1. Using Trapazoidal Method



2. Using Simpson Method



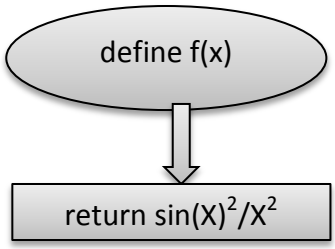
Discussion and Conclusion

from the graph of error vs n for both method, we can conclude that simpson method is more reliable for integration.
While coding, we defined an array of function rather than taking it individually. In this way it became easier and cleaner.

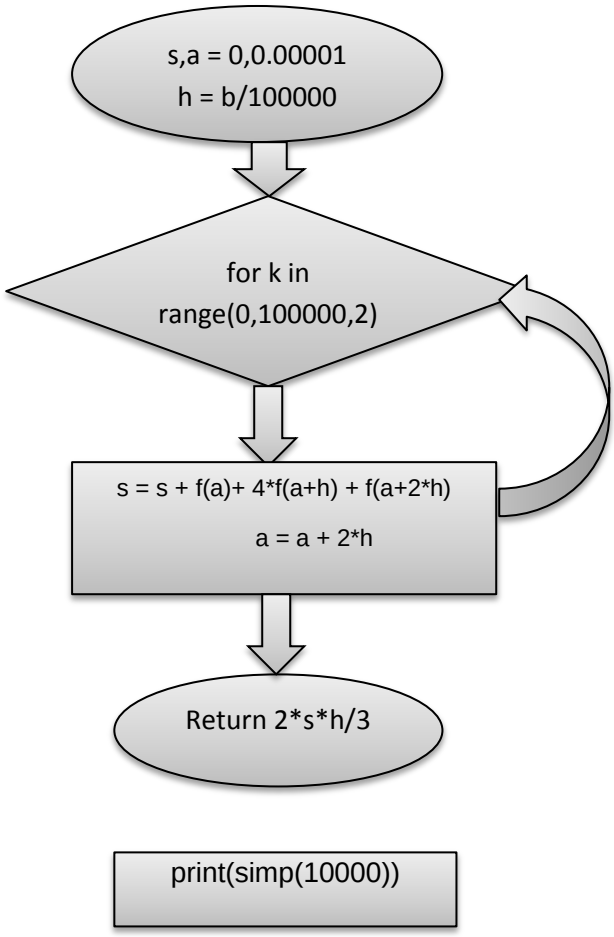
Problem – 2

Method :

Define given function



Function defined for simpson method



Result :

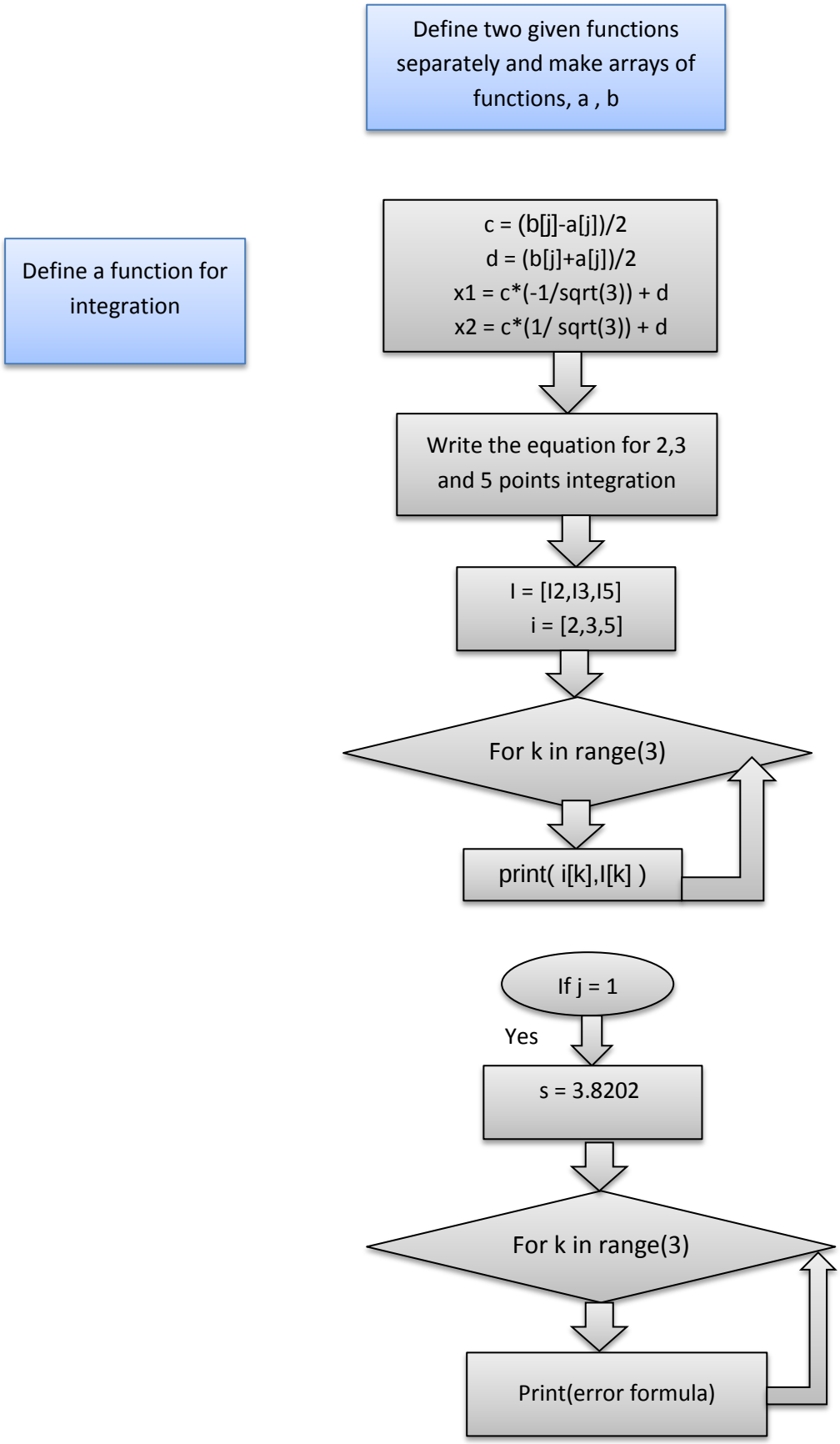
We used simpson method to evaluate the integration for b=10000, n = 100000 and **ε** = 0.000001 and got the value of integration **3.141490650679012.**

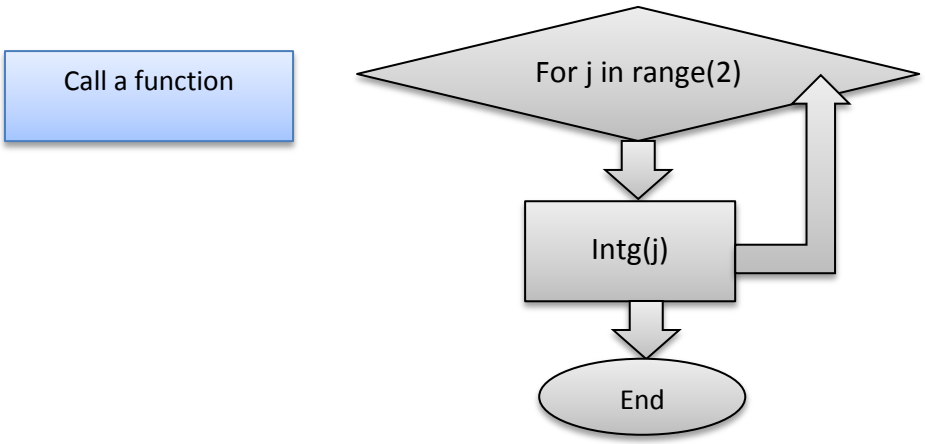
Discussion and Conclusion :

we used simpson method for evaluation as we know it is more reliable. The analytical value of integration is **π**.So the result is correct up to 3 decimal points.

Problem – 3

Method :





Result :

We run the program and got following output :

Using 2 points : 0.47768754038252625
Using 3 points : 0.365839095091072
Using 5 points : 0.37885954412917944

Using 2 points : 3.9989762910745306
Using 3 points : 3.788985746247758
Using 5 points : 3.818609738799552
Error
Using 2 points : 4.679762606003108 %
Using 3 points : 0.8170842822952133 %
Using 5 points : 0.04162769489680372 %

Discussion and Conclusion :

As from the result we can see that the error is reducing with increase in number of points. So we should use maximum points to minimize the error.

We defined a separate function to integrate which uses 2,3 and 5 point method. Also an arrays of functions and limits are used. This way program became easier and cleaner.