

Question 2

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1 Introduction

We are writing a program in C to find the average distance between two random points within a square.

2 Formula

$$8 \int_0^{\pi/4} \frac{\sec^3 \theta}{12} - \frac{\sec^3 \theta \tan \theta}{20} d\theta$$

3 Result

The average distance between two random points within a square calculated by the program over different numbers of intervals is shown in the table below. The error is calculated by considering the exact value to be,

$$\frac{2 + \sqrt{2} + 5 \ln(\sqrt{2} + 1)}{15} \approx 0.52140$$

Number of Intervals	Trapezoidal Rule Result	Error	Order of Convergence
20	0.521457	0.000052	2.005928
40	0.521418	0.000013	2.001493
80	0.521409	0.000003	2.000374
160	0.521406	0.000001	2.000094
320	0.521406	0.000000	2.000094

References

- [1] Distance Between Two Random Points In A Square – Sunday Puzzle:
<https://mindyourdecisions.com/blog/2016/07/03/distance-between-two-random-points-in-a-square-sunday-puzzle/>.