

# Area Estimation Using the Monte Carlo Method

## Exercise 8

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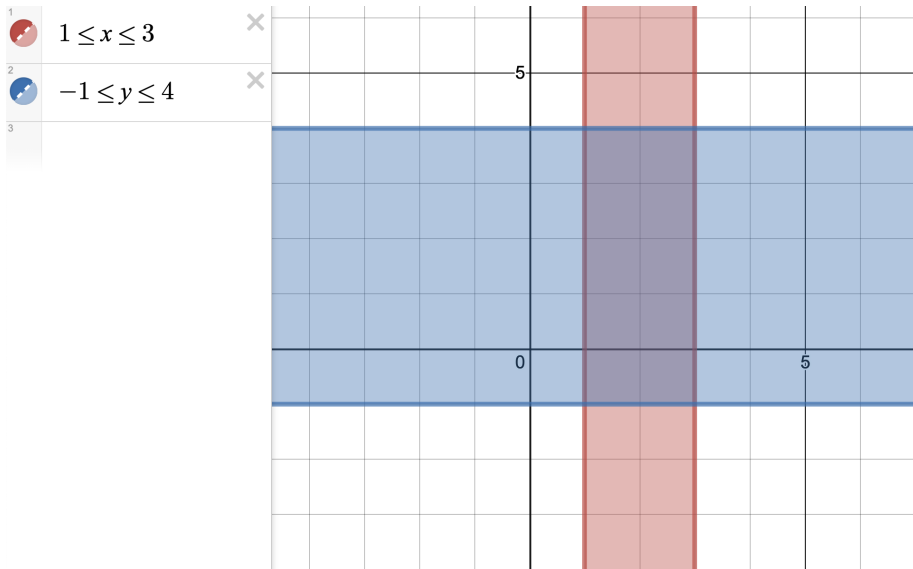
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## Problem Statement

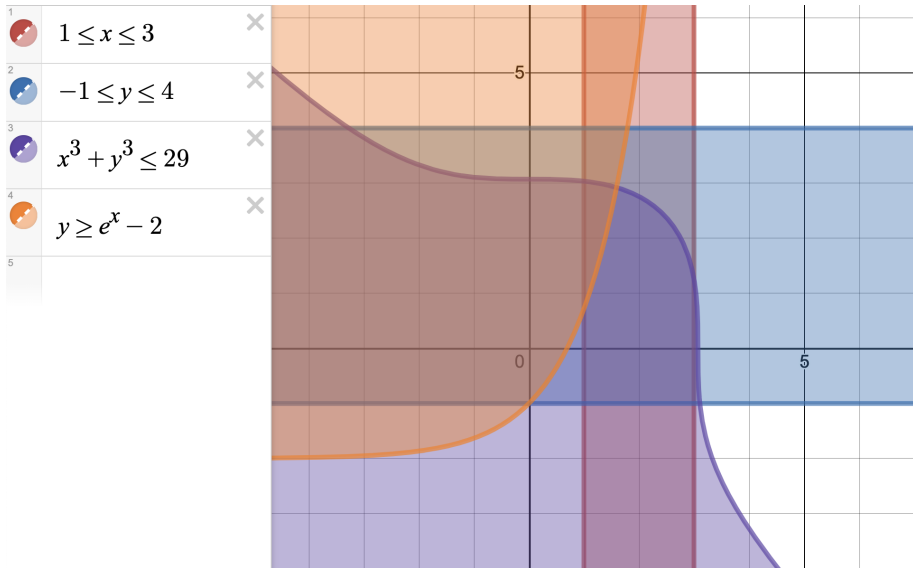
Use the Monte Carlo method to approximate the area of the figure defined by

$$\begin{cases} 1 \leq x \leq 3 \\ -1 \leq y \leq 4 \\ x^3 + y^3 \leq 29 \\ y \geq e^x - 2 \end{cases}$$

# Bounding Box



# Full System



# Tools

- C
- C Math Library
- Intel Math Kernel Library (more specifically, the Vector Statistical Library)
- OpenMP

# Approach

Generate a number in the rectangle and check if it satisfies.

Variables:

## Mathematical Solution

I've used Maple to calculate the following integral:

$$\int_1^a (\sqrt[3]{29 - x^3} - e^x + 2) dx \approx 7.581218821150386e - 01$$

with  $a = 1.593743361313601$ , point of intersection between the two curves defined by  $y \geq e^x - 2$  and  $y \leq \sqrt[3]{29 - x^3}$ .

# Error



# Observations