Infilect Assignment

Problem Assignment:

Part A: Largest Rectangle in Matrix via Fast API Problem Statement: You are given a matrix of integers. Your task is to find the largest rectangle formed by similar numbers in the matrix. A rectangle is defined by selecting a group of adjacent cells that contain the same number. The rectangle should have the maximum area among all rectangles formed by similar numbers.

Part B: Create a Fast API service that accepts the matrix on a POST API and returns the largest rectangle's area and the number itself.

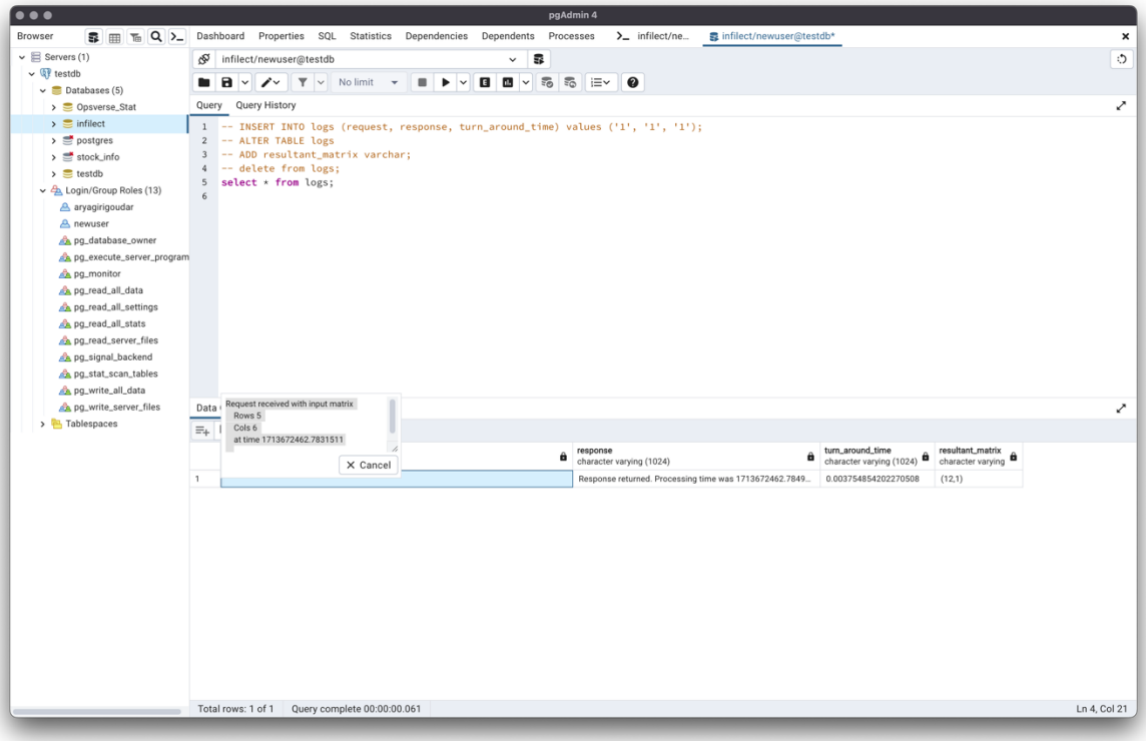
Methodology:

1. We first try to construct height list that is height of rectangle, i.e. when we add 1 to every element below element then result is height of that rectangle and we do this for whole matrix.
2. While 1st row is calculated we use monotonic stack to track increasing heights, because we need max height,
    a. Height is already calculated, width can be calculated by adding current index with index of top of stack (largest yet rectangle). If stack is empty then there is not rectangle larger than current rectangle
    For ex: if height is 2, and 3rd index rectangle is smaller than 2 then we pop element from stack and calculate width as 1 (current-index (3)-1 – stack index (2)) 3 – 2 = 1
3. We do this for 1 and 0.
4. If there are numbers that are other than 1 and 0 then we need to get unique numbers and loop through one of each of them and temporarily make other numbers as 0, while we keep count of max area also
5. Due to requirement not clearly mention, Assuming squares as not rectangle, to do this we have condition to check if width = height that is if we have width same as height then its square

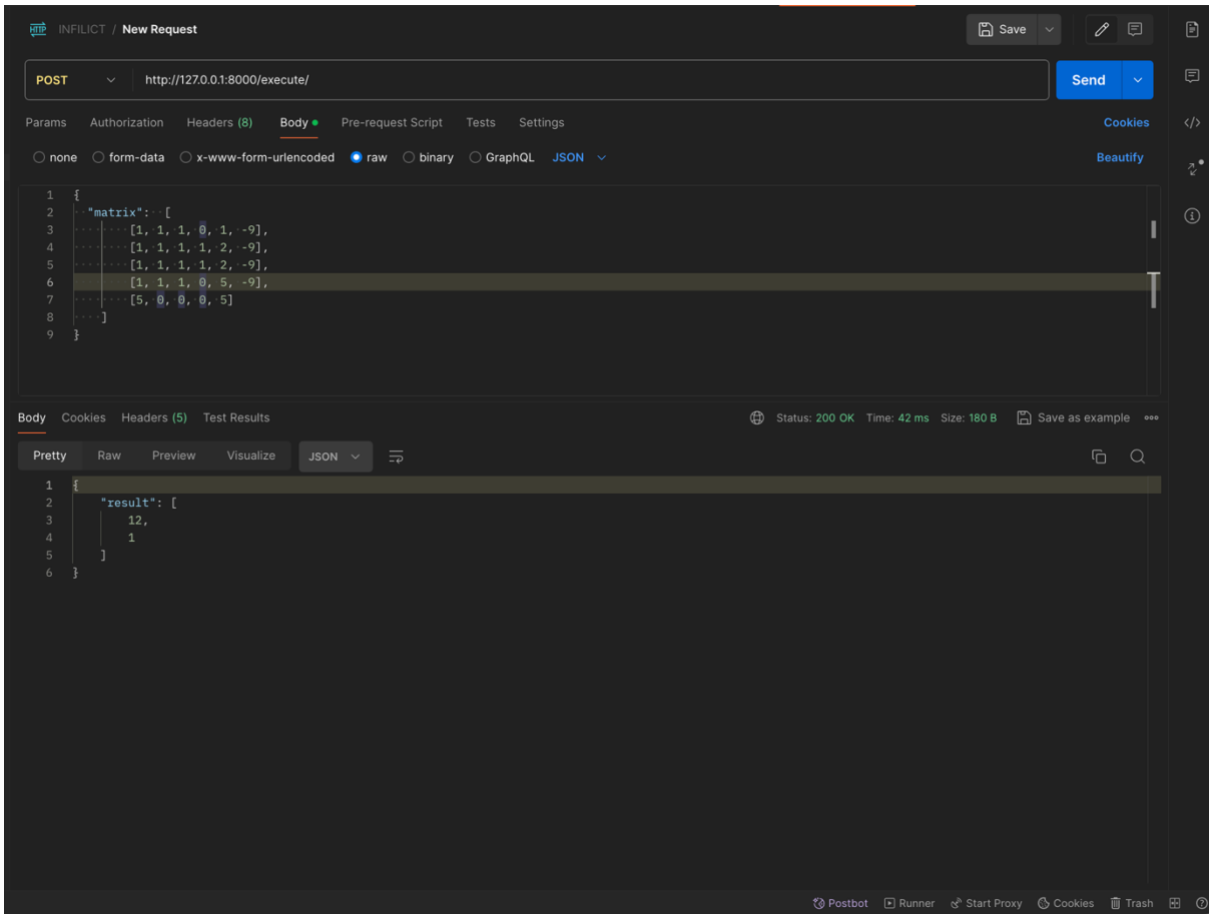
Edge Case: When matrix rows are not all same, then find out the row and append 0

Request Log in app.log file

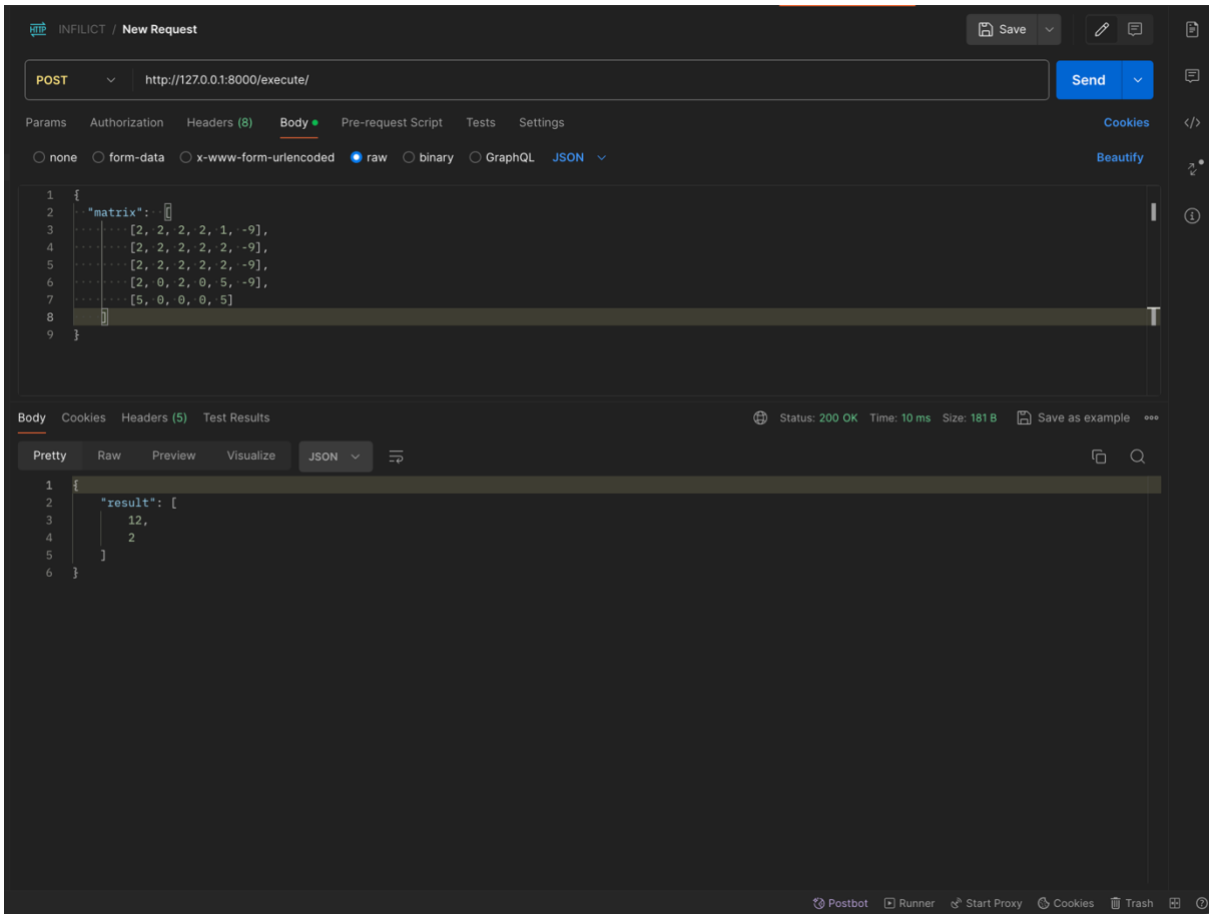
pgAdmin Screen shot of request and response being logged with result and turnaround time



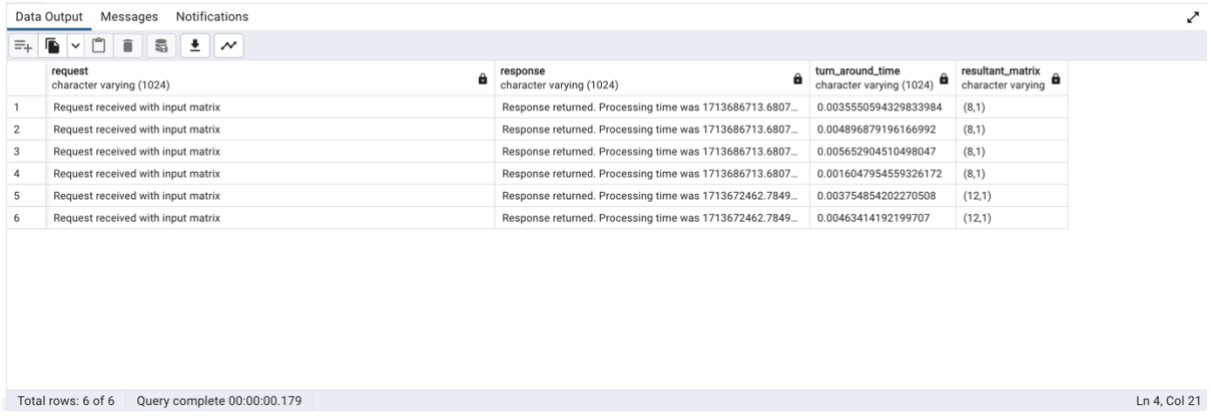
API Result in postman



Matrix 2 (input matrix with 2 forming max rectangle)



pgAdmin output



Matrix 3 (Original Matrix)