SINGAPORE INSTITUTE OF TECHNOLOGY

Please write clearly:

Name: _____

Student ID: _____

CSD2181/CSD2183

Data Structures

Homework 1, Exercise 1.3 – Trimester 2, AY2024/25

Instructions to students:

Your answers must fit within the designated boxes. Do not resize them. Gradescope requires your answers to be placed precisely in these locations.

(a) Insert your measured running times in the following format:

dimension	log(dimension)	log(basic_ms)	log(strassen_ms)
8	2.07944	-0.254247	-0.191652
16	2.77259	1.84228	1.8106
32	3.46574	3.88877	3.70046
64	4.15888	5.96018	5.62782
128	4.85203	8.03849	7.57597
256	5.54518	10.1914	9.58275

(5 points)

(b) Insert a diagram displaying your running-time measurements. Include one curve for basic divide-and-conquer matrix multiplication and another for Strassen's algorithm. Place log(T) on the y-axis and log(n) on the x-axis.

(5 points)

(c) Assume that the running times obey these equations:

$$\log T_{\text{basic}} = a_{\text{basic}} + b_{\text{basic}} \log n_{\text{basic}},$$

$$\log T_{\text{Strassen}} = a_{\text{Strassen}} + b_{\text{Strassen}} \log n_{\text{Strassen}}.$$

Perform linear regression on the data you presented in parts (a) and (b) to estimate b. Enter your numerical estimates for b_{basic} and b_{Strassen} in the box below.

(10 points)

$b_{\text{basic}} =$

$b_{\text{Strassen}} =$

(d) Comment on your plot.

(5 points)

---END OF EXERCISE 1.3---