Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

1) Let \( a \) be an element of \( \mathbb{Z}/(n) \). What is the time complexity (in bit operations) of computing \( a^d \) in \( \mathbb{Z}/(n) \)?

- \( \mathcal{O}(d, n^2) \)
- \( \mathcal{O}(\log d, n^2) \)
- \( \mathcal{O}(d, \log^2 n) \)
- \( \mathcal{O}(\log d, \log^2 n) \)

No, the answer is incorrect
Score: 0
Accepted Answer:
\( \mathcal{O}(\log d, \log^2 n) \)

2) What is the time complexity of multiplying two \( n \times n \) lower triangular matrices?

- \( \mathcal{O}(n^3) \) using \( \frac{n}{3} \times \frac{n}{3} \times \frac{n}{3} \) sized block multiplication
- \( \mathcal{O}(n^{\log_3 18}) \) using \( \frac{n}{3} \times \frac{n}{3} \times \frac{n}{3} \) sized block multiplication
- \( \mathcal{O}(M(n)) \), where \( M(n) \) is the time complexity of multiplying two general \( n \times n \) matrices.
- \( \mathcal{O}(n^{2.376}) \), where \( M(n) \) is the time complexity of multiplying two general \( n \times n \) matrices.

No, the answer is incorrect
Score: 0
Accepted Answer:
\( \mathcal{O}(M(n)) \), where \( M(n) \) is the time complexity of multiplying two general \( n \times n \) matrices.

3) Which of the following is false for matrix multiplication of two \( n \times n \) matrices?

- It can be done in \( \mathcal{O}(n \log n) \) time.
- It can be done in \( \mathcal{O}(n^{\log_2 3}) \) time.
- It can be done in \( \mathcal{O}(n^2) \) time.
- It can be done in \( \mathcal{O}(n^{2.376}) \) time.

No, the answer is incorrect
Score: 0
Accepted Answer:
It can be done in \( \mathcal{O}(n \log n) \) time.

4) Strassen's recursive matrix multiplication algorithm reduces the number of multiplications over the naive method in each recursive step. For \( 3 \times 3 \) matrices \( A \) and \( B \), what is the number of multiplications required by the naive method (multiplying each row of \( A \) with each column of \( B \)) vs Strassen's method?

- \( 8 \) vs \( 6 \)
- \( 7 \) vs \( 5 \)
- \( 8 \) vs \( 7 \)
- \( 7 \) vs \( 5 \)

No, the answer is incorrect
Score: 0
Accepted Answer:
8 vs 7

5) The naive algorithm for multiplying two \( n \times n \) matrices requires \( \mathcal{O}(n^3) \) multiplications. There has been a lot of work to improve this bound. What is the complexity of the current best algorithm?

- \( \mathcal{O}(n^{2.376}) \)
- \( \mathcal{O}(n^{2.373}) \)
- \( \mathcal{O}(n^{2.372}) \)
- \( \mathcal{O}(n^{2.371}) \)

No, the answer is incorrect
Score: 0
Accepted Answer:
\( \mathcal{O}(n^{2.373}) \)

6) Revise the definition and facts about Tensors from lectures and answer which of the following is correct?

- Order 3 tensor rank computation is NP-hard.
- Rank of an order \( n \) tensor lies between \( n^2 \) and \( n^3 \).

No, the answer is incorrect
Score: 0
Accepted Answer:
Both 1 and 2.