
Quick Assignment 2

Total: 100

CS 2500: Algorithms

Due Date: September 4, 2024 at 11.59 PM

Instructions

- Submit your solutions by the deadline specified above.
- Ensure that your work is your own.
- Write your answers clearly and show all your work.
- If you have any questions, ask during recitations or office hours.

Problems

1. Prove that

$$1^2 + 3^2 + 5^2 + \cdots + (2n+1)^2 = \frac{(n+1)(2n+1)(2n+3)}{3}$$

whenever n is a nonnegative integer. **[25 points]**

2. Prove that

$$3^n < n!$$

if n is an integer greater than 6. **[25 points]**

3. (a) Find a formula for:

$$S_n = \frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \cdots + \frac{1}{n(n+1)}$$

by examining the values of this expression for small values of n . **[25 points]**

- (b) Prove the formula you conjectured in part (a). **[25 points]**