Math for CS 2015/2019 Problem Set 9 solutions

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May 30, 2022

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1   Problem 1

Assuming the following sum equals a polynomial in n, find the polynomial. Optionally, you might want to use induction to prove that the sum equals the polynomial you find, but no such proof is required for full credit.

$$\sum_{i=1}^{n} i^3$$

Proof.   □

2   Problem 2

Show that
$$\ln(n^2!) = \Theta(n^2 \ln n)$$

Hint: Stirling's formula for $(n^2)!$.

Proof.   □

3   Problem 3

Prove that
$$\sum_{k=1}^{n} k^6 = \Theta(n^7)$$

Hint: One solution uses the Integral Method, and there are other workable approaches that avoid calculus.

Proof. □