

Objectives: Upon completing this assignment, you will be able to:

1. Use basic math notations, including summation
2. Use proof techniques, including proof by contradiction and prove by induction.
3. Recognize the definition and properties of the Big-O notation

Exercises (20 pts):

1. (7pts) Prove by induction that for any positive integer n ,

$$\sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4}.$$

2. (8pts) In each case below, explain why the given expression is true:

(a) $3n^2 + 100n + \log(n) = O(n^2)$

(b) $(\sqrt{n} + 1)^8 = O(n^4)$

3. (5pts) Prove by contradiction that $100n + 2 \neq O(\sqrt{n})$.

Submission: Hand in a hard copy of your work to the instructor at the start of the class on the due date.

Notes: If you hand-write, please write it clearly, otherwise your homework may be rejected. If you type your homework nicely, you will get **1 point bonus**.

Please also be reminded that this assignment must be done individually. You may discuss the problems (not the solutions) with your classmates, but your submitted work must be written in your own words. Works that too similar may be penalized. Works obtained from an unauthorized source will get no credits.