Analysis of Algorithms - Homework I

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1 Instructions

1. The homework is due on September 13, in class.
2. Attempt as many problems as you can. You will be given partial credit.

2 Problems

1. Show using mathematical induction (3 points)

$$\sum_{i=1}^{n} i^3 = [\frac{n \cdot (n+1)}{2}]^2$$

2. Show using mathematical induction (2 points)

$$\sum_{i=0}^{n} a^i = \frac{1 - a^{n+1}}{1 - a}, \quad 0 < a \neq 1$$

3. Show that $O(\max\{f(n), g(n)\}) = O(f(n) + g(n))$ (3 points)
4. Consider the experiment of throwing a pair of dice. Let A be the event that the first die shows up prime and B be the event that the sum of the two dice is 8. Are events A and B independent? (2 points)