Induction Homework

CS161

July 13, 2016

1 General Instructions

Refer to the PDF in the class code (july-11/resources):
Inductive Proof Examples

2 Series Summations

1. Show that $1^3 + 2^3 + ... + n^3 = [n(n+1)/2]^2$ for every positive integer n.
2. Show that $1 * 1! + 2 * 2! + ... + n * n! = (n+1)! - 1$ for ever positive integer n.
3. Show that $1^2 + 3^2 + 5^2 + ... + (2n+1)^2 = (n+1)(2n+1)(2n+3)/3$ for ever positive integer n.
4. Show that the sum of the first n even positive integers is $n(n+1)$.

3 Problems involving inequality

1. Prove that for all integers $n \leq 4 : n^2 \leq n!$
2. Prove that for all integers $n > 1 : n! < n^n$

4 Problems involving divisibility

There is an example in the link above.

1. Prove that 3 divides $n^3 + 2n$ for every non-negative integer n.
2. Prove that 6 divides $n^3 - n$ for every non-negative integer n.

5 Problems from other domains

1. Prove that every amount of postage of 6 cents or higher can be formed using just 2 cent and 5 cent stamps.