Homework 9
Mathematical foundations of informatics (I201, 2008)
Instructor: Tang

(This HW will be collected on 12/10 Wed. in the class. Write LEGIBLY and explain your answers clearly. The homework you hand in must be your own work, IN YOUR OWN WORDS and your own explanation. **NO late homework will be accepted.**)

1. (50pts) Use mathematical induction to prove the following theorems, for all $n \in \mathbb{Z}^+$.
   a. $2 + 4 + 6 + \ldots + 2n = n(n+1)$
   b. $3 \mid (n^3 + 2n)$
   c. $\frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \ldots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$
   d. $1^2 + 3^2 + 5^2 + \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$
   e. $1 + 2 + 3 + \ldots + n < \left(\frac{2n+1}{8}\right)^2$