

Homework 3

These are to be turned in as hard copy. You can write solutions out by hand, or write them on your computer and print them. If there are multiple pages, please staple them together.

When a problem is given by number, it is from the textbook. 1.1.2 means “problem 2 from section 1.1”.

Problems to write up and turn in:

1. Prove by mathematical induction that the following formula is true for every positive integer n .

$$\sum_{i=1}^n (-1)^{i+1} i^2 = \frac{(-1)^{n+1} n(n+1)}{2}$$

2. Prove (not necessarily directly by mathematical induction) that $\sum_{i=1}^n i \cdot r^i < \frac{r}{(1-r)^2}$ for all $n \geq 1$ and $0 < r < 1$.
3. Let F_n be the n^{th} Fibonacci number (recall that $F_0 = 0$ and $F_1 = 1$ in our formulation). Show by mathematical induction that for all $n > 0$,

$$\sum_{i=1}^n F_i^2 = F_n F_{n+1}$$

4. Prove by mathematical induction that F_n is even if and only if n is divisible by 3.
5. 3.1.2 (algorithms for computing a^n)
6. 3.1.4 (polynomial evaluation)
7. 3.1.6 (stability of selection sort)
8. 3.1.7 (selection sort linked list)