[40] **Homework 2**: *Mathematical Induction*

Due: September 18 by the end of the class.

[10] Using induction, verify the following identity for every positive integer n:

$$\sum_{k=1}^{n} \frac{1}{k(k+1)} = 1 - \frac{1}{n+1}.$$

Compare it with the answer you obtained in Homework 1.

[10] Find a formula for
$$\sum_{i=1}^{n} i^2 2^i.$$

[10] Find a formula for
$$\sum_{k=0}^{n} (-1)^k k^2.$$

[10] Prove by induction on k that
$$\sum_{i=1}^{n} i^k \leq \frac{n^k (n+1)}{2}.$$