

## CS220 Written Homework 1: Induction

**name:**

**eid:**

Print this document two-sided and fill in your answers (the CS department printers can do this easily).

Assignments on notebook paper or printed single-sided will have a 50% penalty.

Assignment due by the start of class. Assignments may be turned in at the end of class for a 50% penalty.

**1. Prove using induction that the predicate  $P(n)$ :  $1*1! + 2*2! + \dots + n*n! = (n+1)! - 1$  is true for any positive integer  $n$ .**

**a) Show that  $P(1)$  is true, completing the base of the induction.**

**b) What do you need to prove in the inductive step? Write out  $P(k) \rightarrow P(k+1)$  for this particular case.**

**c) Complete the inductive step.**

**2a) Find a formula for  $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \dots + \frac{1}{n \cdot (n+1)}$  by examining the values of this expression for small values of n.**

**2b) Prove the formula you found by induction. Follow the format of question 1.**