

**CS161 Fall 16 Homework 3**  
**Due - classtime 10/31**

**name:**

**id:**

1. Let  $P(n)$  be the statement that  $1^3+2^3+\dots+n^3=(n*(n+1)/2)^2$  for positive integers  $n$ .

a) What is the statement  $P(1)$ ?

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

c) What is the inductive hypothesis?

d) What do you need to prove in the inductive step?

e) Complete the inductive step.

2) Prove using induction that  $1 \cdot 1! + 2 \cdot 2! + \dots + n \cdot n! = (n+1)! - 1$  for any positive integer  $n$ .

a) What is the statement  $P(1)$ ?

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

c) What is the inductive hypothesis?

d) What do you need to prove in the inductive step?

e) Complete the inductive step.

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

3b) Prove the formula you found by induction. Follow the format of question 1.