

CS2022/MA2201
HW#5

DUE: Thursday, September 23 (Professor Ruiz's birthday)

1. (10 points) Suppose you believe that $1*1!+ 2*2!+ \dots + n*n! = (n+1)!-1$ for all positive integers n .

(a) Write $P(1)$. Is $P(1)$ true?

(b) Write $P(4)$. Is $P(4)$ true?

(c) Write $P(n)$ using summation symbols (do not use "...").

(d) Write $P(n + 1)$ using summation symbols (do not use "...").

(e) Use the Principle of Mathematical Induction to prove that $P(n)$ is true for all $n \geq 1$.

2. (6 points) Prove by Mathematical Induction that n^2+n is even for all positive integers n , that is, $(\forall n \in \mathbb{Z}^+) 2 \mid (n^2 + n)$.

3. (1 point) Do **Exercise 4.1.6** from our text.

4. (3 points) (a) How many bit strings of length 12 are there?

(b) How many bit strings of length 12 that begin with 110 are there?

(c) How many bit strings of length 12 that begin with 11 and end with 10 are there?