

## CISC-102 WINTER 2017

### HOMEWORK 3

Please work on these problems and be prepared to share your solutions with classmates in class next Monday. Assignments will **not** be collected for grading.

#### READINGS

Read sections 1.8 of *Schaum's Outline of Discrete Mathematics*.  
Read section 2.1 of *Discrete Mathematics Elementary and Beyond*.

#### PROBLEMS

- (1) Prove using mathematical induction that the sum of the first  $n$  natural numbers is equal to  $\frac{n(n+1)}{2}$ . This can also be stated as:  
Prove that the proposition  $P(n)$ ,

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

is true for all  $n \in \mathbb{N}$

- (2) Prove using mathematical induction that the proposition  $P(n)$ ,

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

is true for all  $n \in \mathbb{N}$

- (3) Prove using mathematical induction that the proposition  $P(n)$ ,

$$\sum_{i=3}^n i = \frac{(n-2)(n+3)}{2}$$

is true for all  $n \in \mathbb{N}$

- (4) Prove using mathematical induction that the proposition  $P(n)$

$$n! \leq n^n$$

is true for all  $n \in \mathbb{N}$ .