CISC-102 FALL 2018

HOMEWORK 9

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

Readings

Read sections 5.3 and chapter 4 of *Schaum's Outline of Discrete Mathematics.*
Read section 3.1, 3.5 and 3.6 of *Discrete Mathematics Elementary and Beyond.*

Problems

(1) In the notes for Week 11 you will find Pascal's triangle worked out for rows 0 to 8. The numbers in row 8 are 1 8 28 56 70 56 28 8 1. Work out the values of rows 9 and 10 of Pascal's triangle with the help of the equation:

$$\binom{n-1}{k} + \binom{n-1}{k-1} = \binom{n}{k}.$$

(2) Show that $\binom{n}{0} = \binom{n-1}{0}$, and that $\binom{n-1}{n-1} = \binom{n}{n}$ by an algebraic argument as well as a counting argument.

(3) Prove (using mathematical induction on n) that:

$$\sum_{m=0}^{n} \binom{m+1}{m} = \binom{n+2}{n}$$

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

(4) Use a truth table to verify that the proposition $p \vee \neg(p \wedge q)$ is a tautology, that is, the expression is true for all values of p and q.

(5) Use a truth table to verify that the proposition $(p \wedge q) \wedge \neg(p \vee q)$ is a contradiction, that is, the expression is false for all values of p and q.

(6) Use a truth table to show that $p \vee q \equiv \neg(\neg p \wedge \neg q)$

(7) Show that the following argument is valid.

$$p \to q, \neg q \vdash \neg p$$