<u>Fall 2020 COT 3100 Homework #2</u>

1) (4 pts) Prove the following set equality properties by membership table:

$$(A - C) \cap (C - B) = \emptyset.$$

2) (4 pts) Prove the following set equality properties by membership table:

$$A \cap (B \cap C) = (A \cap B) \cap C.$$

3) (4 pts) Prove by simplification using set equality laws that

$$\big((A \cap B) \cup (A \cap \bar{B}) \cup (\bar{A} \cap B)\big) = (A \cup B).$$

4) (5 pts) Prove by simplification using set equality laws that

$$A \cap \Big(\big((A \cup B) \cap C\big) \cup \big((A \cup B) \cap \bar{C}\big)\Big) = A$$

Please follow these directions for questions 5 - 8:

Prove the following subset and set equality properties by considering arbitrary elements of the subset and applying the principle of universal generalization. (For set equalities, you have to do this twice.)

5) (3 pts) $(A \cup B) \subseteq (A \cup B \cup C)$

6) (3 pts) $(A \cap B \cap C) \subseteq (A \cap B)$

7) (6 pts) $(B - A) \cup (C - A) = (B \cup C) - A$

8) (6 pts) $A \cup (A \cap B) = A$

9) (5 pts) Prove or disprove for arbitrary sets *A*, *B* and *C*:

if $(B - A) \subseteq (C - A)$, then $B \subseteq C$.

10) (5 pts) Prove or disprove for arbitrary sets *A*, *B* and *C*:

if $B \subseteq C$, then $A \cap B \subseteq A \cap C$

11) (5 pts) Give a summary of the life and mathematical contributions of Daniel Bernoulli. Make sure to mention the Bernoulli Principle.