

Fall 2022 COT 3100 Homework #2

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

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

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

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

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

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

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

$$A \cup \left(\overline{A \cap (\bar{B} \cap \bar{A})} \right) = \mathcal{U}$$

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) $(A \cup B) \cap C \subseteq (A \cap B) \cup C$

6) (4 pts) $A - B - C \subseteq A - (B - C)$

7) (6 pts) $(A \cup \bar{B} \cup \bar{C}) = \mathcal{U} - ((B \cap C) - A)$

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

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

$$\text{if } B \subseteq C, \text{ then } B - A \subseteq C - A.$$

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

$$\text{if } A \subseteq B \text{ and } C \subseteq D, \text{ then } A \cup C \subseteq B \cap D$$

11) (5 pts) Give a summary of the life (on going) and mathematical contributions of Ingrid Daubechies.