HW 1

Author : Haonan(Harry) Chen

Class Section: 802 Loop

**Section 1.2**

**8.a :** Yes. All elements in C are in A.

**8.c:** Yes. All elements in C are belonging to itself.

**9.c:** No.

**9.d:** Yes.

**9.g:** No.

**Section 2.1**

**17:** ?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P | Q |  |  |  |  |  |
| T | T | F | F | T | F | F |
| T | F | F | T | F | F | T |
| F | T | T | F | F | F | T |
| F | F | T | T | F | T | T |

and have different truth values in the second and third row, so they are not logically equivalent.

**29:** This computer program does not have logical error in the first ten lines and it is being run with complete data set.

**37:** .

**43:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P | Q |  |  |  |  |  |
| T | T | F | F | T | F | T |
| T | F | F | T | F | T | T |
| F | T | T | F | T | F | T |
| F | F | T | T | T | F | T |

It’s truth values are all T’s, so is a tautology.

**52:**

By De Morgan’s law

By Distributive law

By Identity law

Q.E.D

**Section 2.2**

**13.b:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P | Q |  |  |  |  |  |
| T | T | F | F | T | F | F |
| T | F | F | T | F | T | T |
| F | T | T | F | T | F | F |
| F | F | T | T | T | F | F |

and are always have same truth value, so they are logically equivalent.

**20.b:** Today is New Year’s Eve and tomorrow is not January.

**38:** If it not rains, Ann will go.

**46.c:** This statement must be true. Since “P only if Q” is logically equivalent to “ if P then Q”, in this case P is the statement “Compound X is boiling”, Q is “its temperature is at least 150°C”, so the statement is logically equivalent to given statement.

**46.d:** Let’s assume P is the statement “Compound X is boiling” and Q is the statement “its temperature is at least 150°C”. This statement could be rewrite as , it is the inverse of the given statement so it is not necessarily true. For instance, if the actual boiling point of X were 200°C, and X’s temperature is 170°C which is not less than 150°C.

**50a:**

By Associative law

By De Morgan’s law

Assume

This statement is a tautology

**Section 3.1**

**1.d:** True.

**4.a:**

is which is true.

is which is true.

is . This is false because .

is . This is false because .

**4.c:** The truth set is

**8.c:** The truth set is .

**10:** Counterexample is .

**23:**

, if x is a computer science student then x needs to take data structures.

, x needs to take data structures.