NYU Computer Science Bridge to Tandon Course Winter 2021

Homework 3

Name: Zecheng Zhang

1 Question 7

3.1.1.a Answer:True

3.1.1.b Answer:False

3.1.1.c Answer:True

3.1.1.d Answer:False

3.1.1.e Answer:True

3.1.1.f Answer:False

3.1.1.g Answer:False

3.1.2.a Answer:False

3.1.2.b Answer:True

3.1.2.c Answer:True

3.1.2.d Answer:True

3.1.2.e Answer:False

3.1.5.b Answer: $\{x \in N^+ : x = 3k, k \in N^+\}$**, infinite**

3.1.5.d Answer: $\{x \in N : x = 10k, k \in N$ **and** $k \leq 100\}$**, the cardinality is 101.**

3.2.1.a Answer:True

3.2.1.b Answer:True

3.2.1.c Answer:False

3.2.1.d Answer:False

3.2.1.e Answer:True

3.2.1.f Answer:True

3.2.1.g Answer:True

3.2.1.h Answer:False

3.2.1.i Answer:False

3.2.1.j Answer:False

3.2.1.k Answer:False

2 Question 8

3.2.4.b Answer: $x = \{\{2\}, \{1, 2\}, \{2, 3\}, \{1, 2, 3\}\}$

$P(A) = \{\emptyset, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{2, 3\}, \{1, 3\}, \{1, 2, 3\}\}$
$\because\{\mathrm{x} \in P(A) : 2 \in x\}$
$\therefore x =$\{\{2\},\{1,2\},\{2,3\},\{1,2,3\}\}

3 Question 9

3.3.1.c Answer: $\{-3, 1, 17\}$

3.3.1.d Answer: $A \cup (B \cap C) = \{-5, -3, 0, 1, 4, 17\}$

3.3.1.e Answer: $A \cap B \cap C = \{1\}$

3.3.3.a Answer: $\bigcap_{i=2}^{5} A_i = \{1\}$

$A_2 = \{1, 2, 4\}$
$A_3 = \{1, 3, 9\}$
$A_4 = \{1, 4, 16\}$
$A_5 = \{1, 5, 25\}$

3.3.3.b Answer: $\bigcup_{i=2}^{5} A_i = \{1, 2, 3, 4, 5, 9, 16, 25\}$

3.3.3.e Answer: $\bigcap_{i=1}^{100} C_i = \{x \in \mathbb{R} : -\frac{1}{100} \leq x \leq \frac{1}{100}\}$

$C_1 = \{x \in \mathbb{R} : -1 \leq x \leq 1\}$
$C_2 = \{x \in \mathbb{R} : -1/2 \leq x \leq 1/2\}$
...
$C_{100} = \{x \in \mathbb{R} : -\frac{1}{100} \leq x \leq \frac{1}{100}\}$

3.3.3.f Answer: $\bigcup_{i=1}^{100} C_i = \{x \in \mathbb{R} : -1 \leq x \leq -1\}$

3.3.4.b Answer: $P(A \cup B) = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}, \{a, b, c\}\}$

3.3.4.d Answer: $P(A) \cup P(B) = \{\emptyset, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}\}$

$P(A) = \{\emptyset, \{a\}, \{b\}, \{a, b\}\}$
$P(B) = \{\emptyset, \{b\}, \{c\}, \{b, c\}\}$

4 Question 10

3.5.1.b Answer: (foam,venti,whole)

3.5.1.c Answer: {(foam,non-fat),(foam,whole),(no-foam,non-fat),(no-foam,whole)}

3.5.3.b Answer:True

3.5.3.c Answer:True

3.5.3.e Answer:True

3.5.6.d Answer: $xy = \{01, 011, 001, 0011\}$

x $\in \{0, 00\}, y \in \{1, 11\}$

3.5.6.e Answer: $xy = \{aaa, aaaa, aba, abaa\}$

x $\in \{aa, ab\}, y \in \{a, aa\}$

3.5.7.c Answer: $(A \times B) \cup (A \times C) = \{aa, ab, ac, ad\}$

$A \times B = \{aa, ac\}$, $A \times C = \{aa, ab, ad\}$

3.5.7.f Answer: $P(A \times B) = \{\emptyset, \{ab\}, \{ac\}, \{ab, ac\}\}$

$A \times B = \{ab, ac\}$

3.5.7.g Answer:

$\because$P(A) $= \{\emptyset, \{a\}\}$
$\because$P(B) $= \{\emptyset, \{b\}, \{c\}, \{b, c\}\}$
$\therefore$P(A) $\times P(B) = \{(\emptyset, \emptyset), (\emptyset, \{b\}), (\emptyset, \{c\}), (\emptyset, \{b, c\}), (\{a\}, \emptyset), (\{a\}, \{b\}), (\{a\}, \{c\}), (\{a\}, \{b, c\})\}$

5 Question 11

3.6.2.b Answer:

$(B \cup A) \cap (\overline{B} \cup A)$	
$(A \cup B) \cap (A \cup \overline{B})$	commutative law
$A \cup (B \cap \overline{B})$	distributive law
$A \cup \emptyset$	complement law
A	identity laws

3.6.2.c Answer:

$\overline{A \cap \overline{B}}$	
$\overline{A} \cup \overline{\overline{B}}$	De Morgan's law
$\overline{A} \cup B$	Double negation law

3.6.3.b Answer:

if $A = \{a, b\}, B = \{a, c\}$
$B \cap A = \{a\}$
$A - (B \cap A) = \{b\} \neq A$

3.6.3.d Answer:

if $A = \{a, b\}, B = \{b, c\}$
$B - A = \{c\}$
$(B - A) \cup A = \{a, b, c\} \neq A$

3.6.4.b Answer:

$A \cap (B - A)$	
$A \cap (B \cap \overline{A})$	set substraction law
$A \cap (\overline{A} \cap B)$	commutative law
$(A \cap \overline{A}) \cap B$	associative law
$\emptyset \cap B$	complement law
$\emptyset$	domination law

3.6.4.c Answer:

$A \cup (B - A)$	
$A \cup (B \cap \overline{A})$	set subtraction law
$(A \cup B) \cap (A \cup \overline{A})$	distributive law
$(A \cup B) \cap U$	complement law
$A \cup B$	identity law