

Homework N6

Problem N1

a) $3 \rightarrow 2^3 = 8$

b) $4 \rightarrow 2^4 = 16$

c) $1 \rightarrow 2^1 = 2$

Problem N2

$A^n \rightarrow m^n$ elements

Problem N3

a) $P(x) = \{-1, 0, 1\}$

b) $Q(x) = \mathbb{Z} - \{0, 1\} = \{\dots, -2; -1, 2, 3, 4, \dots\}$

c) $R(x) = \emptyset$

$2x + 1 = 0$

$2x = -1$

$x = -\frac{1}{2}$ = an empty set

Problem N4

$A = \{p, d, q\} \rightarrow 2^3 = 8$ possible sets

$A(x) = \{\emptyset, \{p\}, \{d\}, \{q\}, \{pd\}, \{pq\}, \{dq\}, \{p, d, q\}\}$

Problem N5

$$1) A \cap B \cap C$$

$$x \in \overline{A \cap B \cap C}$$

$$x \notin A \cap B \cap C$$

$$\neg((x \in A) \wedge (x \in B) \wedge (x \in C))$$

$$\neg(x \in A) \vee \neg(x \in B) \vee \neg(x \in C)$$

$$x \notin A \vee x \notin B \vee x \notin C$$

$$x \in \overline{A} \vee x \in \overline{B} \vee x \in \overline{C}$$

$$x \in \overline{A \cup B \cup C}$$

$$\overline{A \cup B \cup C}$$

2)

$$A \quad B \quad C \quad A \cap B \cap C \quad \overline{A \cap B \cap C} \quad \overline{A} \quad \overline{B} \quad \overline{C} \quad \overline{A \cup B \cup C}$$

$$1 \quad 1 \quad 1 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0$$

$$0 \quad 1 \quad 1 \quad 0 \quad 1 \quad 1 \quad 0 \quad 0 \quad 1$$

$$1 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0 \quad 1$$

$$1 \quad 1 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 1 \quad 1$$

$$1 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \quad 1 \quad 1 \quad 1$$

$$0 \quad 1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 0 \quad 1 \quad 1$$

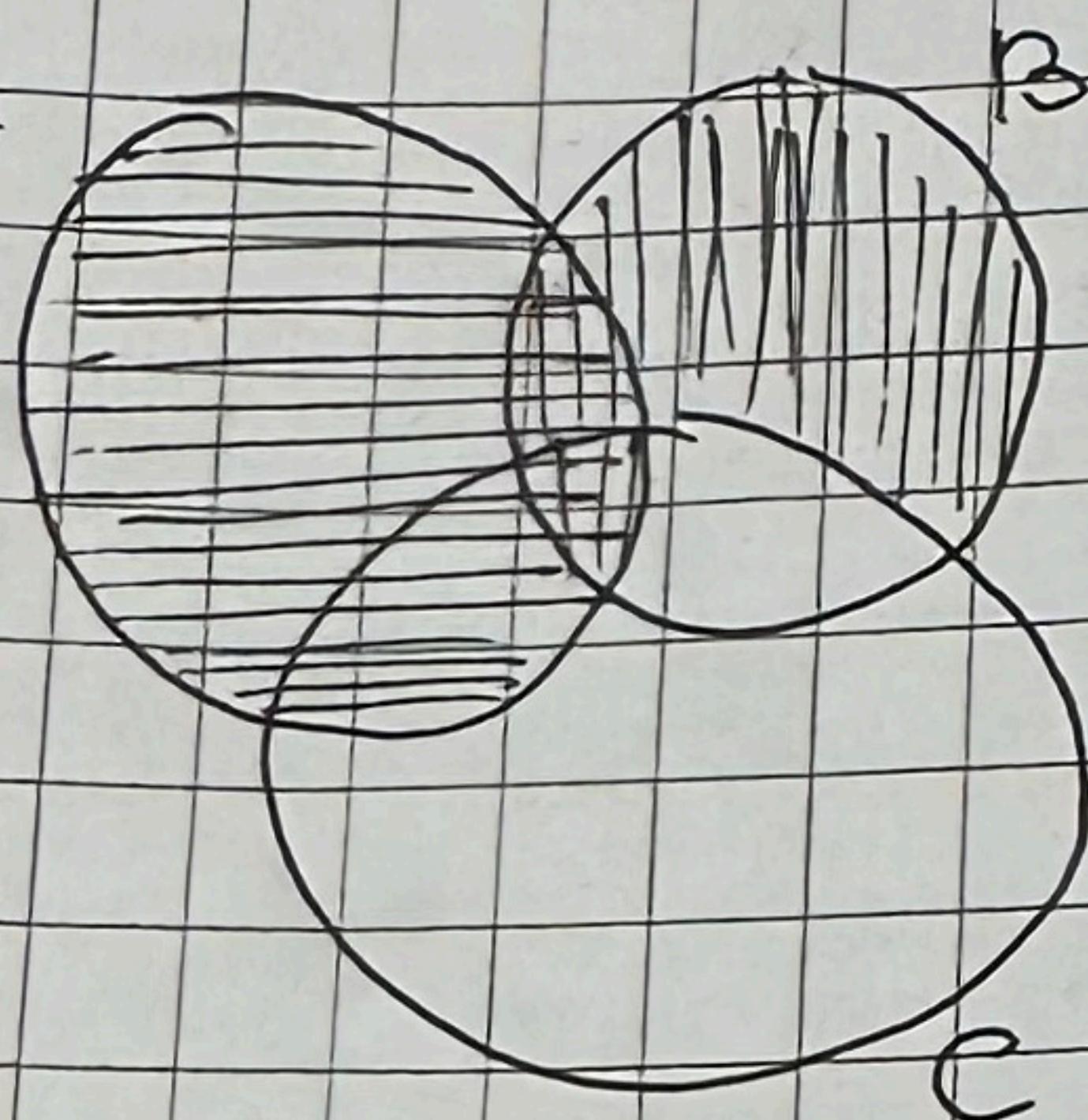
$$0 \quad 0 \quad 1 \quad 0 \quad 1 \quad 1 \quad 0 \quad 1 \quad 1$$

$$0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1 \quad 1 \quad 1$$

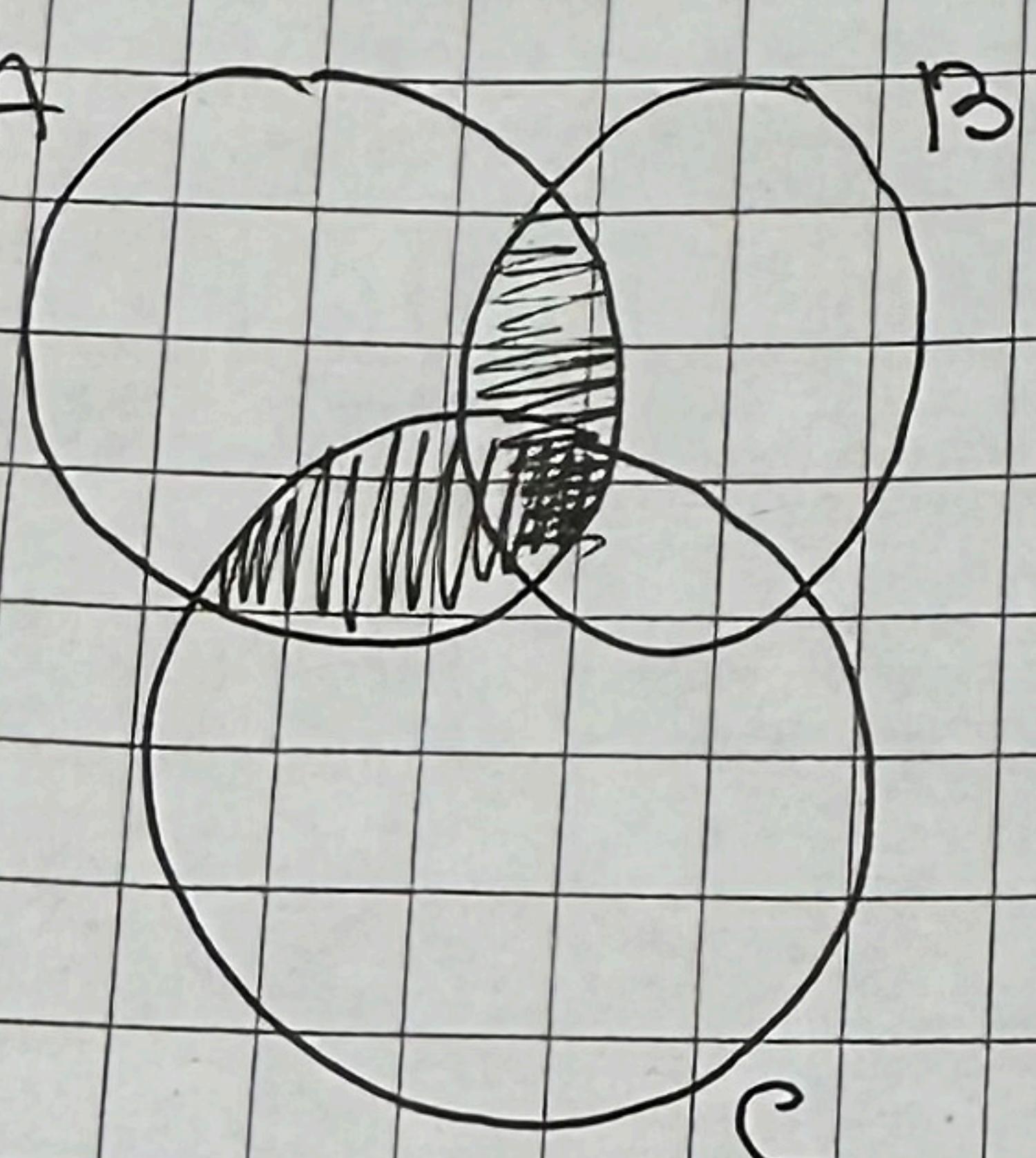
q3

Problem 6

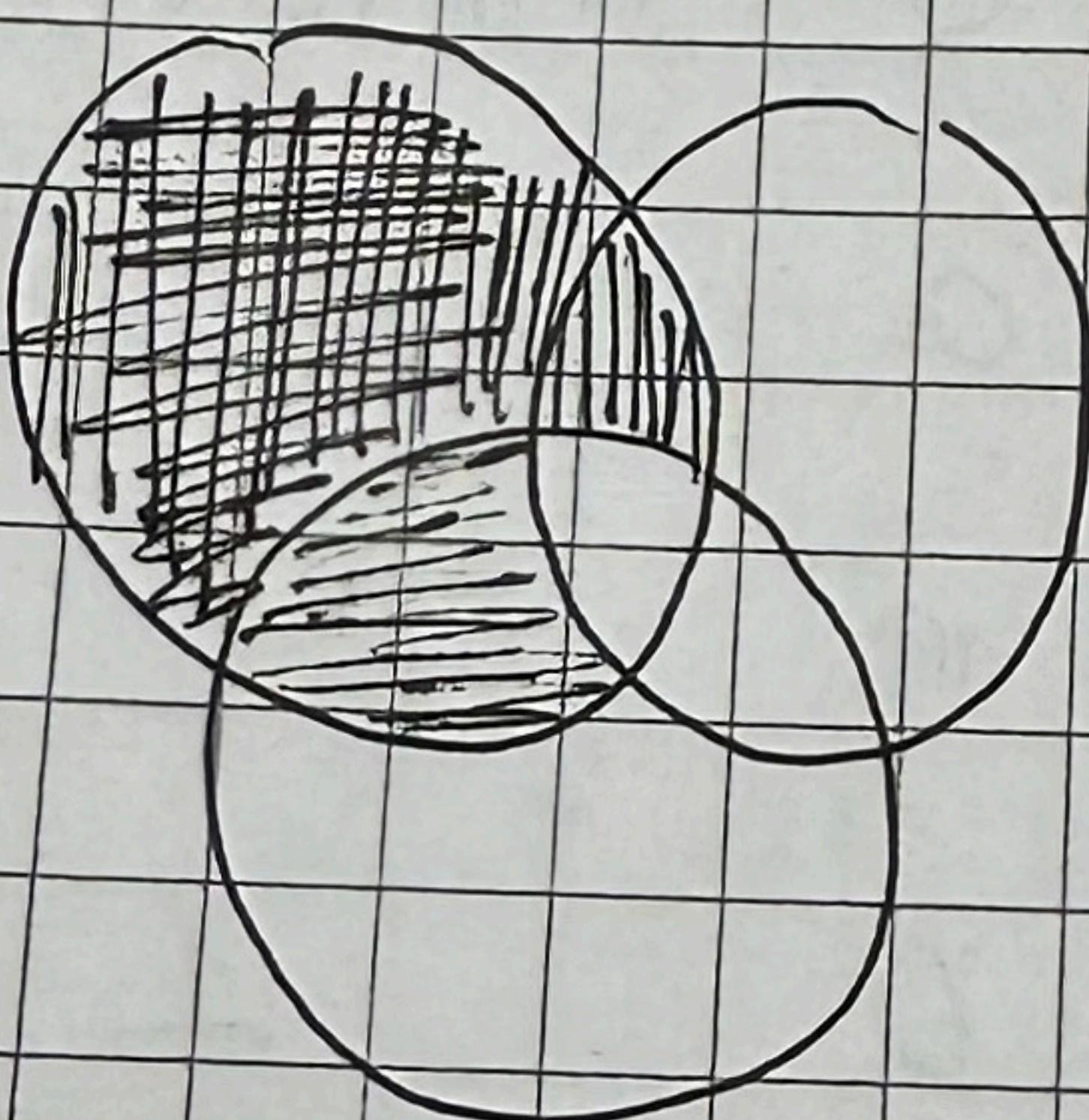
a)



b)



c)



Problem 7

$$a) A \cup B = A \rightarrow B \subseteq A$$

$$b) A \cap B = A \rightarrow A \subseteq B$$

$$c) A - B = A \rightarrow A \cap B = \emptyset$$

$$d) A \cap B = B \cap A$$

$$e) A - B = B - A \rightarrow A = B$$

Problem 8

$A \oplus B$, not in both A and B

$$A, B, C \rightarrow A \oplus C \neq B \oplus C \rightarrow A = B?$$

$$A = B \rightarrow x \in B = x \in A$$

$$A \oplus C = B \oplus C \rightarrow x \in A$$

$$\text{if } x \in C \rightarrow x \notin A \oplus C \rightarrow x \notin B \oplus C$$

if $x \notin B \rightarrow B \oplus C$, but it's not true

$$x \in B, \text{ then } x \in A \oplus C \rightarrow x \in B \oplus C.$$

Problem 9

$$a) A_1 \subset A_2 \subset A_3 \subset A_4 \dots$$

$$\bigcup_{i=1}^{\infty} A_i = \mathbb{Z} \rightarrow \bigcap_{i=1}^{\infty} A_i = A_1 = \{-1, 0, 1\}$$

$$b) \bigcup_{i=1}^{\infty} A_i = \mathbb{Z} - \{0\} \rightarrow \bigcap_{i=1}^{\infty} A_i = \emptyset$$

$$c) \bigcup_{i=1}^{\infty} A_i = \mathbb{R} \rightarrow \bigcap_{i=1}^{\infty} A_i = A_1 = \{-1, 1\}$$

$$d) \dots \subset A_3 \subset A_2 \subset A_1$$

$$\bigcup_{i=1}^{\infty} A_i = \bigcup_{i=1}^{\infty} A_i = A_1 = [1, \infty] \rightarrow \bigcap_{i=1}^{\infty} A_i = \emptyset$$