

Introductory Mathematics: Algebra and Analysis Solutions

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0.1 Chapter 1

0.1.1 Exercises

Notes

\mathbb{N} = Set of Natural numbers, $\{1, 2, 3, \dots\}$

\mathbb{Z} = Set of Integers, $\{\dots, -2, -1, 0, 1, 2, \dots\}$

\mathbb{Q} = Set of Rational Numbers, $Q = \{\frac{a}{b} | a, b \in \mathbb{Z}, b \neq 0\}$

\mathbb{R} = Set of Real numbers

1.1

$A = \{1, 2, 3\}, B = \{1, 2\}, C = \{1, 3\}, D = \{2, 3\}, E = \{1\}, F = \{2\}, G = \{3\}, H = \emptyset$

a) $A \cap B = B$

b) $A \cup C = A$

c) $A \cap (B \cap C) = E$

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

e) $A \setminus B = G$

f) $C \setminus A = H$

g) $(D \setminus F) \cup (F \setminus D) = G$

h) $G \setminus A = H$

j) $A \cup ((B \setminus C) \setminus F) = A$

k) $H \cup H = H$

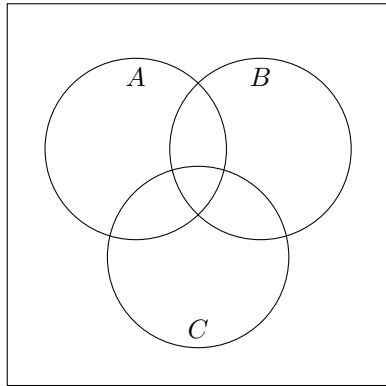
l) $A \cap A = A$

m) $((B \cup C) \cap C) \cup H = C$

1.2

- a) i and ii are the same, iii is different
- b) i and ii are the same, iii is different
- c) $i = \{1, 2, 3, 4, 5, 6, 7\}$, $ii = \{1, 2, 3, 4, 5, 6, 7, -1, -2, -3, -4, -5, -6, -7\}$, $iii = \{1, 2, 3, 4, 5, 6, 7\}$, so i and iii are the same, ii is different
- d) $i = \{0, 1, 2, 3, \dots\}$, $ii = \{1, 2, 3, \dots\}$, $iii = \{1, 2, 3, \dots\}$, ii and iii are the same, i is different
- e) i and iii are the same, ii is different
- f) ii and iii are same, i is different
- g) ii and iii are same, i is different
- h) i and iii are same, ii is different
- j) $i = \emptyset$, $ii = \emptyset$, $iii = \{\emptyset\}$ i and ii are same, iii are different
- k) ii and iii are the same, i is different
- l) ii and iii are the same, i is different
- m) $i = \{\emptyset, \{\emptyset\}, 0\}$, $ii = \{\emptyset, \{\emptyset\}, 0\}$, $iii = \{\emptyset, 0\}$ i and ii are same, iii different

1.3



- a)
- b)

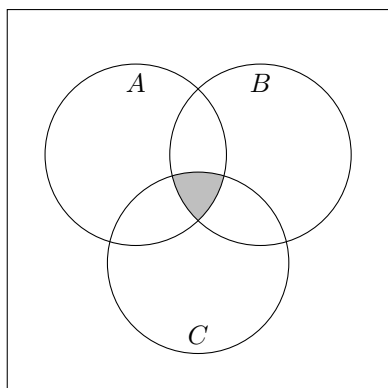


Figure 1: $A \cap B \cap C$

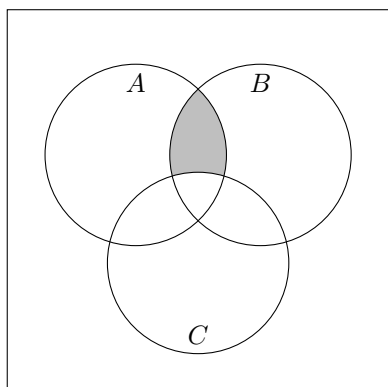


Figure 2: $A \cap B \cap C'$

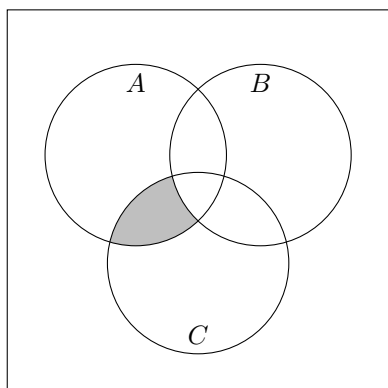


Figure 3: $A \cap B' \cap C$

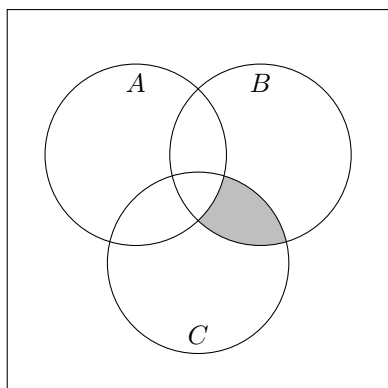


Figure 4: $A' \cap B \cap C$

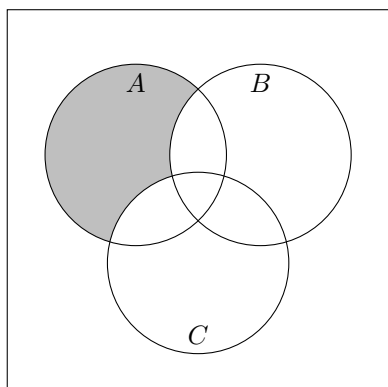


Figure 5: $A \cap B' \cap C'$

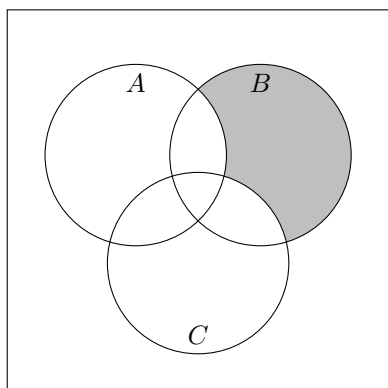


Figure 6: $A' \cap B \cap C'$

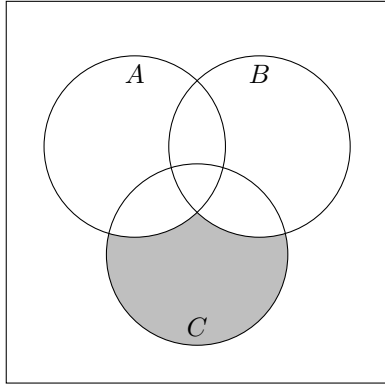


Figure 7: $A' \cap B' \cap C$

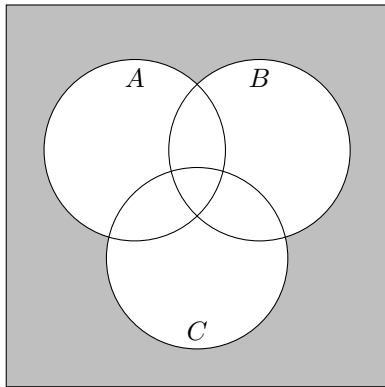


Figure 8: $A' \cap B' \cap C'$

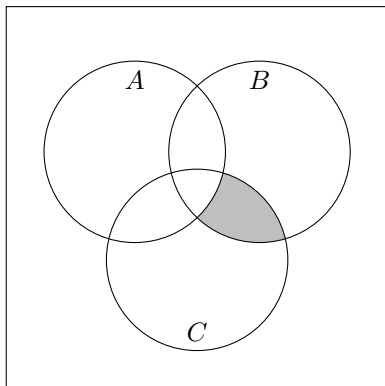


Figure 9: $(A \cup (B' \cup C'))'$

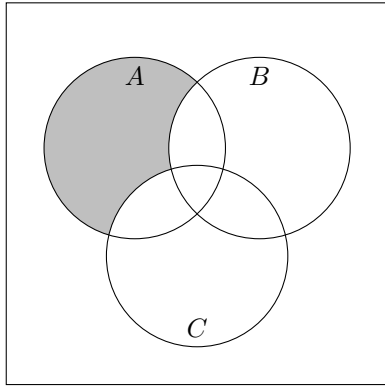


Figure 10: $(A' \cup B \cup C)'$

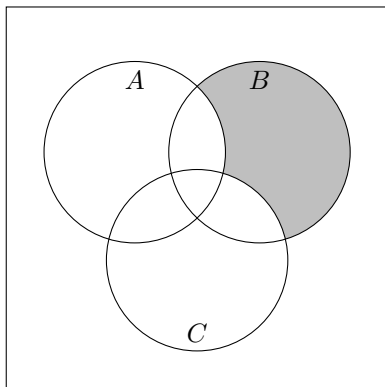


Figure 11: $(A \cup B' \cup C)'$

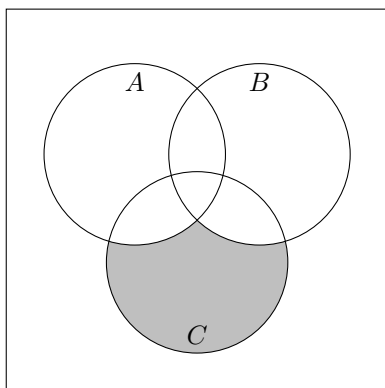


Figure 12: $(A \cup B \cup C')'$

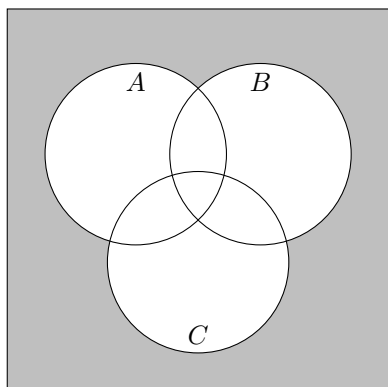


Figure 13: $(A \cup B \cup C)'$