ICS 6A
Solution to Homework Assignment 2
Winter 2004

Instructor: Rina Dechter January 27rd, 2004

1. Rosen, Page 85: 4. A = {2, 4, 6}, B = {2, 6}, C = {4, 6}, D = {4, 6, 8}
   Solution: $B \subseteq A$, $C \subseteq A$, $C \subseteq D$.

2. Rosen, Page 85: 6.
   a) $\{x \in R | x \textit{ is an interger greater than } 1\}\}$: {2} is NOT an element of that set.
   b) $\{x \in R | x \textit{ is the square of an interger}\}\}$: {2} is NOT an element of that set.
   c) $\{2, \{2\}\}$: {2} is an element of that set.
   d) $\{\{2\}, \{\{2\}\}\}$: {2} is an element of that set.
   e) $\{\{2\}, \{2, \{2\}\}\}$: {2} is an element of that set.
   f) $\{\{\{2\}\}\}$: {2} is NOT an element of that set.

3. Rosen, Page 85: 14.
   a) $|\phi| = 0$
   b) $|\{\phi\}| = 1$
   c) $|\{\phi, \{\phi\}\}| = 2$
   d) $|\{\phi, \{\phi\}, \{\phi, \{\phi\}\}\}| = 3$

4. Rosen, Page 85: 24. A = {a, b, c}, B = {x, y}, C = {0, 1}

   a) $A \times B \times C$ = { (a, x, 0), (a, x, 1), (a, y, 0), (a, y, 1),
   (b, x, 0), (b, x, 1), (b, y, 0), (b, y, 1),
   (c, x, 0), (c, x, 1), (c, y, 0), (c, y, 1) }

   b) $C \times B \times A$ = { (0, x, a), (0, x, b), (0, x, c), (0, y, a), (0, y, b), (0, y, c),
   (1, x, a), (1, x, b), (1, x, c), (1, y, a), (1, y, b), (1, y, c) }

   c) $C \times A \times B$ = { (0, a, x), (0, a, y), (0, b, x), (0, b, y), (0, c, x), (0, c, y),
   (1, a, x), (1, a, y), (1, b, x), (1, b, y), (1, c, x), (1, c, y) }

   d) $B \times B \times B$ = { (x, x, x), (x, x, y), (x, y, x), (x, y, y),
   (y, x, x), (y, x, y), (y, y, x), (y, y, y) }

5. Rosen, Page 95: 4. A = {a, b, c, d, e} and B = {a, b, c, d, e, f, g, h}
   a) $A \cup B$ = {a, b, c, d, e, f, g, h} = B
   b) $A \cap B$ = {a, b, c, d, e} = A
   c) $A - B = \phi$
   d) $B - A$ = {f, g, h}

6. Rosen, Page 95: 16. Show that if A and B are sets, then $(A \cap B) \ \cup \ (A \cap \overline{B}) \ = \ A$

Proof: $(A \cap B) \ \cup \ (A \cap \overline{B}) = A \cap (B \cup \overline{B})$ Distributive laws (TABLE 1 on page 49 of Rosen)
$= A \cap U$
$= A$ Identity laws (TABLE 1 on page 89 of Rosen)

7. Rosen, Page 95: 20: See page 3 for the diagrams
a) $A \cap (B \cup C)$
b) $\overline{A} \cap \overline{B} \cap \overline{C}$
c) $(A - B) \cup (A - C) \cup (B - C)$

8. Rosen, Page 310: 4.
Solution: There are
$12(\#\ of\ color) \times 2(\#\ of\ gender) \times 3(\#\ of\ size) \ = \ 72$
types of this shirt are made.

9. Rosen, Page 310: 16.
Solution: total number of strings with four lowercase letters: $264 \ = \ 456976$
number of strings with four lowercase letters without "x": $254 \ = \ 390625$
There are 456976 - 390625 = 66351 strings of four lowercase letters that have the letter "x" in them.

10. Rosen, Page 312: 44.
Solution: 38 + 23 - 7 = 54 students are in the class.

Rosen, page 55: 18.

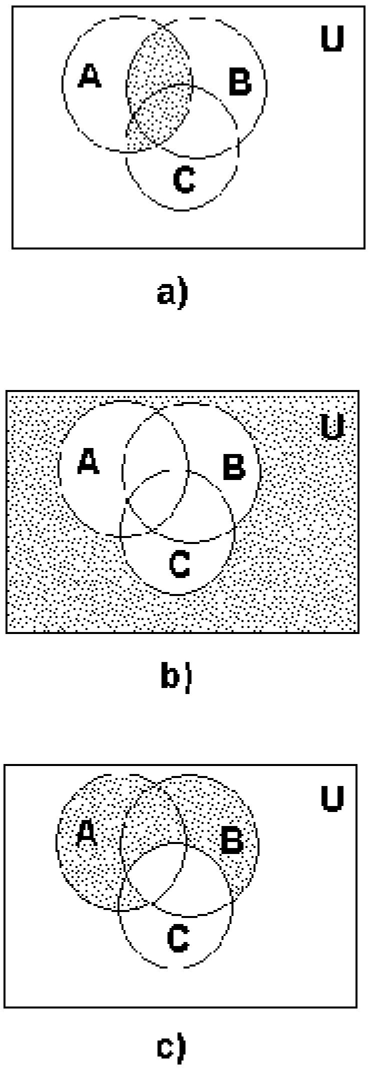

Figure 1: Rosen