BRONX COMMUNITY COLLEGE

of The City University of New York

DEPARTMENT OF MATHEMATICS and COMPUTER SCIENCE

CSI 30

Test 2: Chapters 2 and 3

(Sample)

Present all your work in order to get full credit.
Show solutions, do not give just answers.

1. For the sets $A = \{a, g, f, d, t\}$, $B = \{f, a, t, g\}$, $C = \{f, g, t\}$.
   Determine whether these statements are true or not:

   (a) $B \subseteq A$
   (b) $C \subseteq A$
   (c) $C \subseteq B$

2. Determine which statements are false or true

   (a) $\{0\} \subseteq \{0\}$
   (b) $\{0\} \in \{0\}$
   (c) $\{1, 2\} \subseteq \{1, \{1, 2\}, \{2\}, \{\{1\}, 2\}, 2\}$
   (d) $\{1\} \in \{1, \{1, 2\}, \{2\}, \{\{1\}, 2\}, 2\}$

3. Determine the cardinality of the set A=$\{x \in Z^+ | x$ is less than 13$\}$

4. Find the powerset of $\{a, b, c\}$

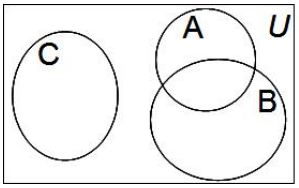
5. For the sets $A = \{1, 2, 8\}$, $B = \{a, b, 8\}$, $C = \{o, m, 1\}$. Find

   (a) Cartesian Product $A \times B \times C$
   (b) Cartesian Product $B \times C$
   (c) Cartesian Product $C \times B$
   (d) $A \bigcap B$
   (e) $B \bigcap C$
   (f) $A \bigcup B \bigcup C$
   (g) $A - C$

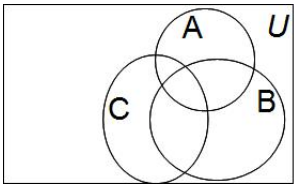
6. What can you say about sets A and B if we know that $A \bigcap B = A$?

7. Can we conclude that $A = B$ if we know that for sets A, B, C the following holds:
   $A \bigcup C = B \bigcup C$?

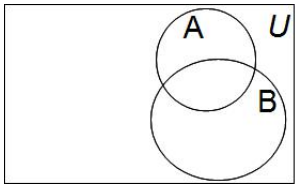
8. For the given sets (see the Venn Diagramm) show on the Diagramm



a) $\overline{A - B}$



b) $A - (B \bigcap C)$



c) $\overline{B} \bigcap A$

9. For each function determine its range

   a) $g(x) = \lfloor x^2 \rfloor$, $\quad g(x) : \mathtt{R} \to \mathtt{R}$

   b) $m(x) = \sqrt{2x}$, $\quad m(x) : \mathtt{R}^+ \to \mathtt{R}^+$

10. Determine whether the given functions are bijective. Are they invertible? If a function is invertible, what is its inverse?

    (a) $f : \{1, 2, 3, 4, 5\} \to \{a, b, c, d\}$ with $f(1) = a$, $f(2) = b$, $f(3) = a$, $f(4) = c$, $f(5) = d$

    (b) $f : R \to R$, $f(x) = -5x^2 + 8$

11. Let $f(x) = 2x + 3$, $g(x) = x - 5$, and $h(x) = x^2$. $f : \mathtt{R} \to \mathtt{R}$, $g : \mathtt{R} \to \mathtt{R}$, $h : \mathtt{R} \to \mathtt{R}$

    Find

    a) $(fg)(x)$

    b) $(g + h)(x)$

    c) $(f \circ h)(x)$