## Math 251

Assignment 5

Mariam Kreydem All exercises from 1- 10 can be found in the book of Kenneth Rosen, seventh edition. 1. List the members of these sets.

(a) {x : x is a real number such that x<sup>2</sup> = 1}.
(b) {x : x is a positive integer less than 12}.
(c) {x : x is the square of an integer and x < 100}.</li>
(d) {x : x is an integer such that x<sup>2</sup> - 2}.

2. Determine whether each of these pairs of sets are equal.

(a) {1,3,3,3,5,5,5,5,5}, {5,3,1}
(b) {{1}}, {1,{1}}.
(c) Ø, {Ø}.

3. For each of the following sets, determine whether 2 is an element of that set.

(a)  $\{2, \{2\}\}$ (b)  $\{\{2\}, \{\{2\}\}\}$ (c)  $\{\{2\}, \{2, \{2\}\}\}$ (d)  $\{\{\{2\}\}\}.$ 

4. Determine whether each of the following statements is true or false.

(a)  $0 \in \emptyset$ . (b)  $\emptyset \in \{0\}$ . (c)  $\{0\} \subset \emptyset$ . (d)  $\emptyset \subset \{0\}$ . (e)  $\{0\} \in \{0\}$ . (f)  $\{0\} \subset \{0\}$ . (g)  $\{\emptyset\} \subseteq \{\emptyset\}$ .

5. What is the cardinality of each of the following sets.

(a)  $\{a\}$ . (b)  $\{\{a\}\}$ . (c)  $\{a, \{a\}\}$ . (d)  $\{a, \{a\}, \{a, \{a\}\}\}$ . 6. How many element does each of the following sets have where a and b are distinct elements.

a)  $\mathcal{P}(\{a, b, \{a, b\}\})$ . b)  $\mathcal{P}(\{\emptyset, a, \{a\}, \{\{a\}\}\})$ . c)  $\mathcal{P}(\mathcal{P}(\emptyset))$ .

7. Prove that  $\mathcal{P}(A) \subseteq \mathcal{P}(B)$  if and only if  $A \subseteq B$ .

8 Let A be a set. Show that  $\emptyset \times A = A \times \emptyset = \emptyset$ .

9. Find the truth set of each of these predicates where the domain is the set of integers.

(a)  $P(x) : x^2 < 3$ . (b)  $Q(x) : x^2 > x$ . (c) R(x) : 2x + 1 = 0.

10. How many different elements does  $A \times B$  have if A has m elements and B has n elements?