

HOMEWORK #1

Problem 1. Show that the following pairs of sets are not equal, by exhibiting an element of one that is not an element of the other.

(a)

$$A = \{1, 2\}$$
$$B = \{1, \{1, 2\}\}$$

(b)

$$C = \mathcal{P}(\{1, 2\})$$
$$D = \{\{1\}, \{2\}\}$$

(c)

$$E = \{1, 2\} \times \{2, 3\}$$
$$F = \{3, 2\} \times \{2, 1\}$$

(d) In this example, n is restricted to being an integer.

$$G = \{2n + 2 \mid 0 \leq n \leq 200\}$$
$$H = \{2n - 2 \mid 0 \leq n \leq 200\}$$

Problem 2. Let

$$A = \{1, 2, 4\}$$
$$B = \{1, 2, 5\}$$

List the elements of the following sets, *without repeating* any elements:

(a)

$$\{\{m, n\} \mid m \in A \text{ and } n \in B\}$$

(b)

$$\{(m, n) \mid m \in A \text{ and } n \in B\}$$

Problem 3. Show that if A is not the empty set, and if

$$A \times B = A \times C$$

then

$$B = C.$$

Problem 4. For each set S described below find $|S|$, the number of elements in S , and $\max(S)$, (the largest number in S):

(a) $\{-10, 2, 3\}$;

(b) $\{x \in \mathbb{Z} \mid x^2 < \pi\}$.

Problem 5. Calculate the following sets:

(a)

$$\{2, 4, 6\} \cap \{n \in \mathbb{Z} \mid n^3 + n^2 - n = 11\}$$

(b)

$$(\{n^2 \mid n \in \mathbb{Z}\} \cup (\{2, 4, 6\} \cap \mathbb{N})) \cup \mathbb{Z}$$