HOMEWORK #1

Problem 1. Give an example of three sets to show that

$$A \subseteq B \quad \text{and} \quad B \in C$$

does not always imply

$$A \in C.$$

Give a second example where $A \subseteq B$ and $B \in C$ and $A \in C$.

Problem 2. 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)

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

(b)

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

(c)

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

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

$$G = \left\{ 2n + 2 \middle| \, 0 \leq n \leq 200 \right\}$$
$$H = \left\{ 2n - 2 \middle| \, 1 \leq n \leq 201 \right\}$$

Problem 3. Let

$$A = \{1, 3, 4\}$$
$$B = \{1, 2, 3\}$$

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

(a)

$$\left\{ \{m, n\} \middle| \, m \in A \text{ and } n \in B \right\}$$

(b)

$$\left\{ (m, n) \middle| \, m \in A \text{ and } n \in B \right\}$$

Problem 4. Show that if

$$A \not\subseteq B$$

then

$$\mathcal{P}(A) \neq \mathcal{P}(B).$$

Problem 5. Find an example that shows it is possible to have

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

and also

$$B \neq C.$$

Problem 6. True or false:

(a) $(1,1) \in \{(1,1),(1,2),(2,1)\} \cap \{(1,2),(2,1)\}$;
(b) $\{1,2\} \in \{(1,1),(1,2),(2,1)\}$;
(c) $(1,2) \in \{1,2\} \times \{2,3\}$.