MATH 2001
QUIZ 3

1.) (1 pt) Write your name in the top *right* corner of the page.

2.) (8 pts) Give the precise definition of each of the following terms. Your answers must be a complete sentence (or sentences).

(a) Finite set

A *finite set* is a set that contains finitely many (distinct) elements.

(b) Union

Given two sets A and B, the *union* of A and B is the set of all elements that are in A or in B (or in both sets). In set builder notation,

$$A \cup B = \{x : x \in A \text{ or } x \in B\}.$$

(c) Finite union

A *finite union* is the union of finitely many sets.

Given a finite list of sets, $A_1, A_2, \ldots, A_n$, the union of these sets is

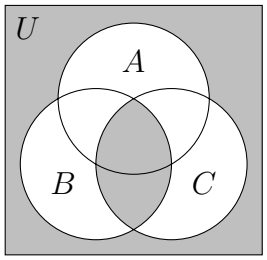
$$\bigcup_{i=1}^{n} A_i = \{x : x \in A_i \text{ for some } i \in \mathbb{Z}, \text{ where } 1 \leq i \leq n\}.$$

(d) Set difference

Given two sets A and B, the *difference* of A and B is the set of all elements that are in A but not in B. In set builder notation,

$$A - B = \{x : x \in A \text{ and } x \notin B\}.$$

3.) (2 pts) Give an expression that describes the shaded region.

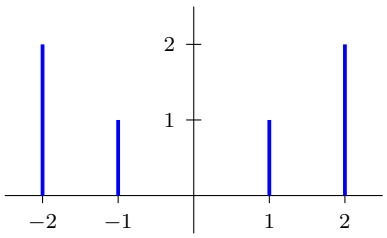


$\overline{A \cup B \cup C} \cup (B \cap C)$

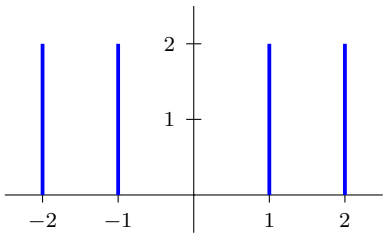
Date: May 4, 2016.

4.) (6 pts) Let $A_n = \{-n, n\}$, $B_n = [0, n]$, and $C_n = A_n \cup B_n$. Sketch each of the following sets in the xy-plane.

(a) $\bigcup_{n=1}^{2}(A_n \times B_n) = (\{-1, 1\} \times [0, 1]) \cup (\{-2, 2\} \times [0, 2])$.

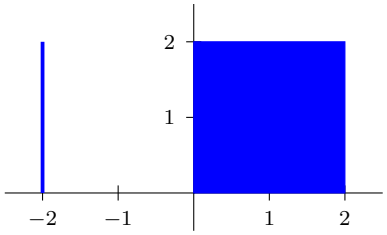


(b) $\left(\bigcup_{n=1}^{2} A_n\right) \times B_2 = (\{-1, 1\} \cup \{-2, 2\}) \times [0, 2] = \{-2, -1, 1, 2\} \times [0, 2]$.



(c.i) $\bigcup_{n \in A_2} (C_n \times B_n) = ((\{-2, 2\} \cup [0, -2]) \times [0, -2]) \cup ((\{-2, 2\} \cup [0, 2]) \times [0, 2])$

$= (\{-2\} \cup [0, 2]) \times [0, 2]$.



(c.ii) $\bigcup_{n \in A_2} (C_n \times A_n) = ((\{-2, 2\} \cup [0, -2]) \times \{-2, 2\}) \cup ((\{-2, 2\} \cup [0, 2]) \times \{-2, 2\})$

$= (\{-2\} \cup [0, 2]) \times \{-2, 2\}$.