

Set Builder Notation

310
Jan 31

$$S = \{x \mid |x| \leq 5\} \quad x \in \mathbb{Z}$$

$$\{-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5\}$$

Null Set

$$\emptyset \quad \{\}$$

$$\{\emptyset, \{\emptyset\}\}$$

set with 2 elements

#1 null set

#2 set with one element which is the null set

$A \not\subset B$ set S

$$A \subset B$$

A is a proper subset of B

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

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

$$A \subseteq B$$

some or all elements of B are elements of A

$$A \subseteq B \quad B \subseteq A$$

$$A = B$$

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

$$A_1 = \{1, 2, 3\}$$

$$A \quad a \in A$$

$$A_2 = \{1, 2\}$$

$$A_3 = \{3\}$$

$$a_j \in A \quad \underline{a} \quad \text{where } j = 1, N$$

$$\emptyset \subseteq S \quad \emptyset \subseteq A$$

$$\emptyset \subseteq B$$

$$\emptyset \subseteq S$$

$$\{\emptyset, a, \{a\}, \{a, b\}\}$$

$$\{1, \{1, 2\}, a, \text{blue}\}$$

Cardinality: the "exact" number of "distinct" elements in a set

$$A = \{1, 2\} \quad |A| = 2$$

$$A = \{1, 2, 2\} \quad |A| = 2$$

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

$$|\emptyset| = 0$$

$$|\{\emptyset, \{\emptyset, \{\emptyset\}\}\}| = 2$$

POWER SET: the set of "all" subsets of the original set

$$A \quad \emptyset$$

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

$$P.S. \{A\} = \{\emptyset, A, \{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$$

$$P(A) = P(\{0, 1, 2, 3\})$$

$$= \{\emptyset, \{0, 1, 2, 3\}, \{0, 3\}, \{1, 3\}, \{2, 3\}, \{0, 1\}, \{0, 2\}, \{1, 2\}\}$$

FACTOID

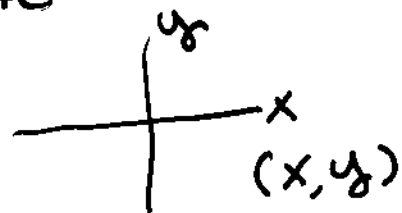
n elements (distinct) in a set A produced a power set with 2^n elements

$$P\{\emptyset\} = \{\emptyset\}$$

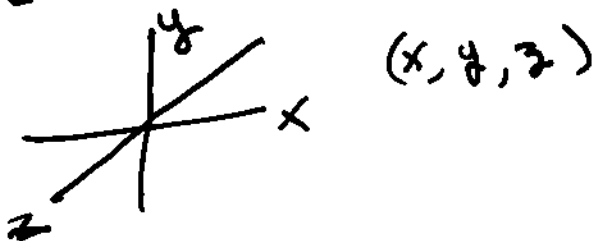
$$P(\{\emptyset, \{\emptyset\}\}) = \{\emptyset, \{\emptyset, \{\emptyset\}\}, \{\emptyset\}, \{\emptyset\}\}$$

Ordered Pairs - Ordered n -tuples
"finite"

$$(a_1, a_2, a_3, a_4, \dots, a_n)$$



3d Cartesian Coordinates



Complex Numbers

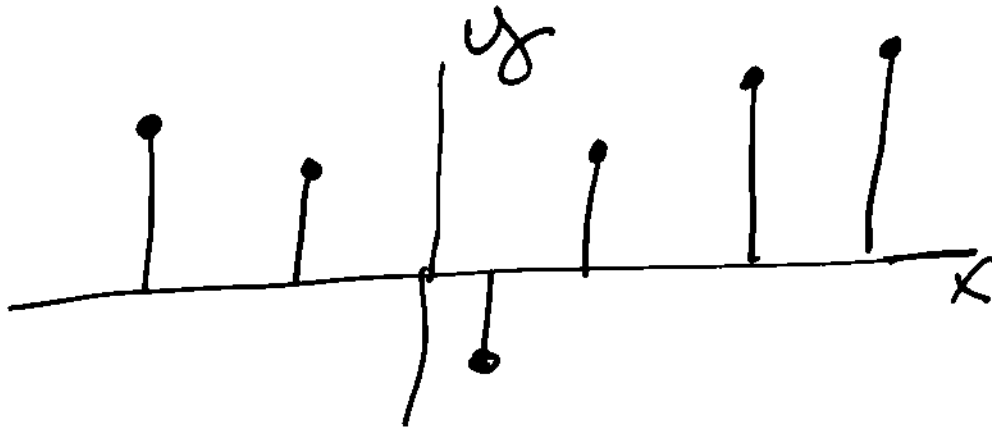
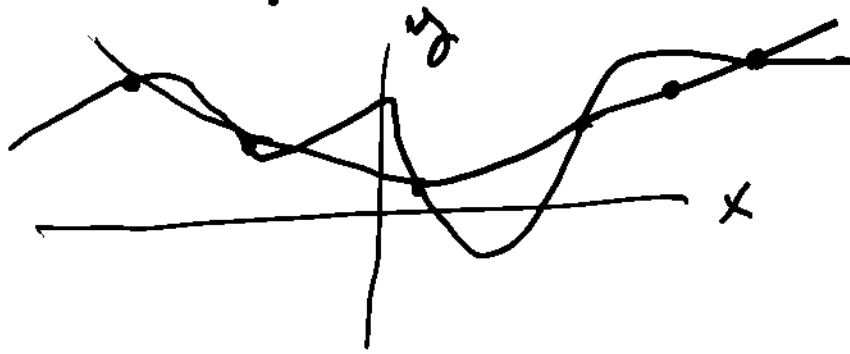
$$x + jy$$

$$R + jx$$

$$(a, b) \neq (b, a)$$

$$(x, y) \neq (y, x)$$

Plotting ordered Pairs



Set Algebra

$$A \times B = \{ (a, b) \mid a \in A \wedge b \in B \}$$

$$A = \{ 1, 2 \} \quad B = \{ a, b, c \}$$

$$A \times B = \{ (1, a), (1, b), (1, c), (2, a), (2, b), (2, c) \}$$

Vector Dot Product

$$x = \{ 1, 2, 3 \}$$

$$y = \{ a, b, c \}$$

$$x \cdot y = \{ 1 \cdot a + 2 \cdot b + 3 \cdot c \}$$

$$A \times B \times C$$

$$A = \{a_1, a_2\} \quad B = \{b_1, b_2\} \quad C = \{c_1, c_2\}$$

$$A \times B \times C = \{ (a_1, b_1, c_1), (a_1, b_1, c_2), (a_1, b_2, c_1), \dots (a_2, b_2, c_2) \}$$

UNION SET

$$A \cup B \quad C = A \cup B$$

"UNION"

$$A \cup B = \{x \mid x \in A \vee x \in B\}$$

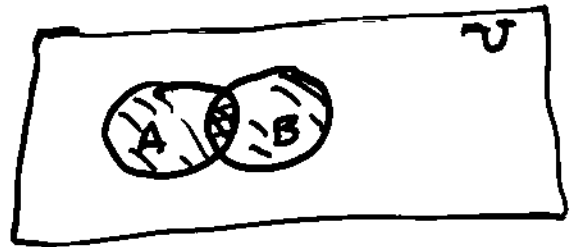
A or B or both

$$A = \{1, 3, 5\}$$

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

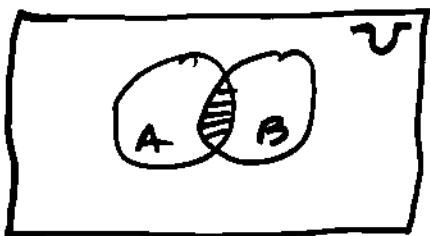
$$A \cup B = \{1, 2, 3, 5\}$$

VENN DIAGRAM



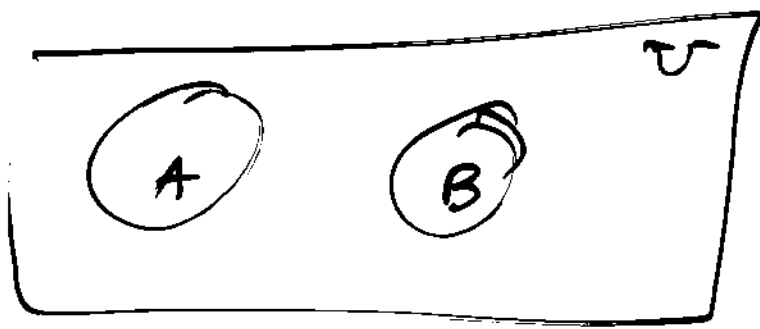
Intersection

$$A \cap B$$



$$A \cap B = \{3, 1\}$$

DISJOINT SET



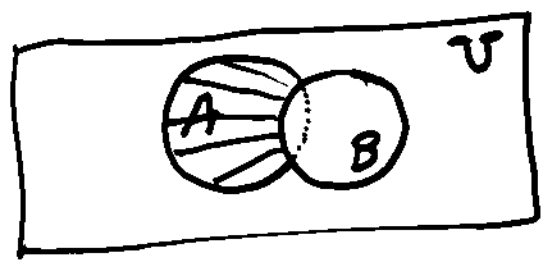
$$A \cap B = \emptyset$$

Subtraction



$$|A \cup B| = |A| + |B| - |A \cap B|$$

$$C = A - B = \{x \mid x \in A \text{ and } x \notin B\}$$



$$\{1, 3, 5\} - \{1, 2, 3\} = \{5\}$$

Complement of a Set

Set A

$$\text{Complement of } A = \overline{A}$$

$$A = \{x \mid x \in A\}$$

$$\overline{A} = \{x \mid x \notin A\}$$