Math 112

Sets → Sets of numbers

$\emptyset = \{\}$ $\quad \mathbb{N} = \{1, 2, 3, 4, \ldots\}$ $\quad W = \{0, 1, 2, 3, \ldots\}$

Integers: $\mathbb{Z} = \{\ldots, -2, -1, 0, 1, 2, \ldots\}$

$\{1, 2, 3, \ldots\}$ | Positive Integers

$\{0, 1, 2, 3, \ldots\}$ Non-Neg. Integers

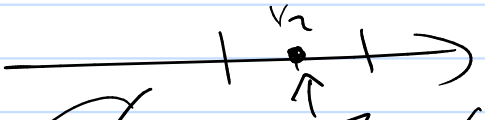
$\{\ldots, -3, -2, -1\}$ Neg. Integers

$\{\ldots, -3, -2, -1, 0\}$ Non-Pos. Integers

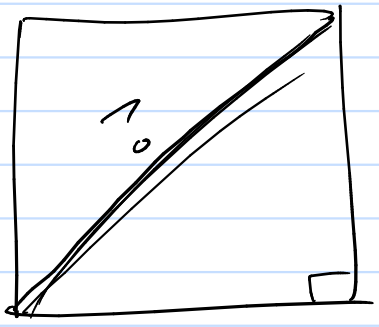
Rationals: $\mathbb{Q} = \left\{ \frac{a}{b} : a \text{ and } b \text{ are integers and } b \neq 0 \text{ and } a, b \text{ have no common factors} \right\}$

Rationals? $\frac{1}{2}, \frac{7}{9}, \frac{1}{1}, \frac{0}{1}$

Not Rational $\frac{\pi}{2\pi}$

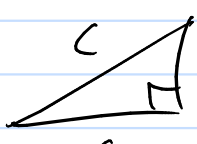


$\frac{2}{3}$ $\quad \frac{1}{2} = \frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{\pi}{2\pi}$



$1^2 + 1^2 = (?)^2$

$2 = (?)^2$

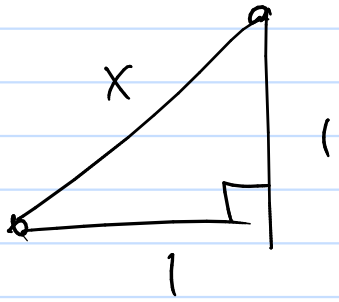


$a^2 + b^2 = c^2$

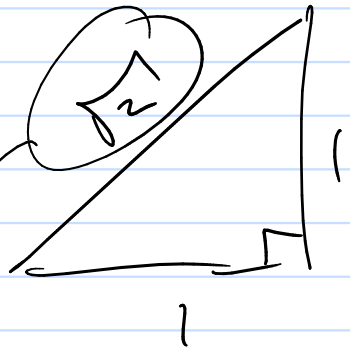
$3^2 + 4^2 = 5^2$

$2 = x^2$

$2 = x \cdot x$



$2 = \left(\frac{a}{b}\right)^2 \Rightarrow 2 = \frac{a^2}{b^2} \rightarrow a^2 = 2b^2$



$(2k)^2 = 2b^2$

$4k^2 = 2b^2$

$2k^2 = b^2$

Irrational $\mathbb{R} = \{ n ;\ n$ can not be written as a rational $\}$

Decimal representations: $\frac{1}{2} = 0.5$

$\frac{1}{9} = 0.111111\ldots = 0.\overline{1}$

Fact: Rational? $\rightarrow$ Decimal version will terminate or repeat.

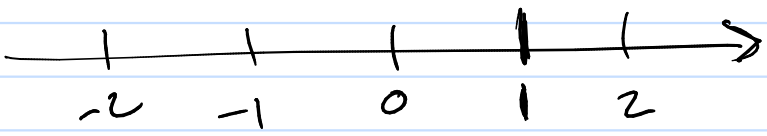
Irrational? $\rightarrow$ Decimal will not terminate and not repeat.

ex $0.12112111211112111112\ldots \neq \frac{a}{b}$

Rationals $\cup$ Irrationals = Reals

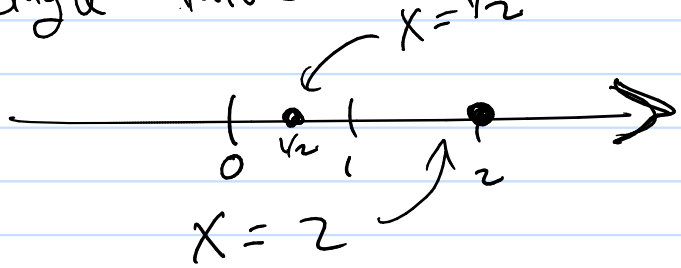
↑ Union

Visualize:

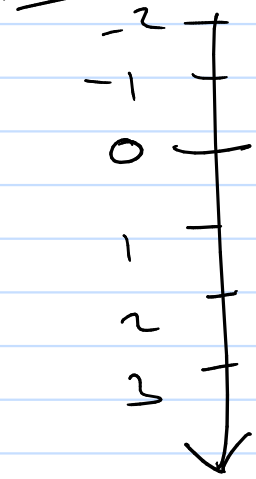


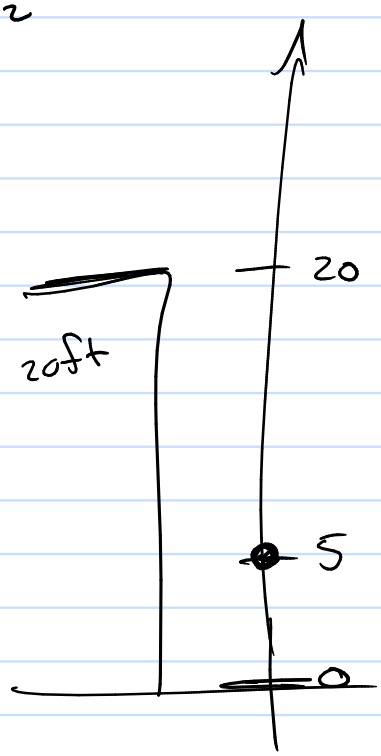
Real Number Line.

Using: ① Single value

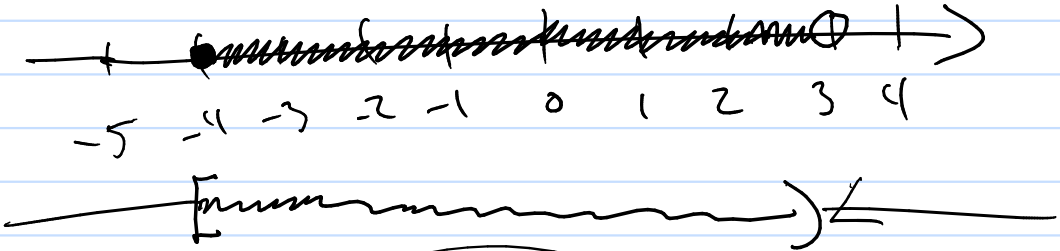


② regions



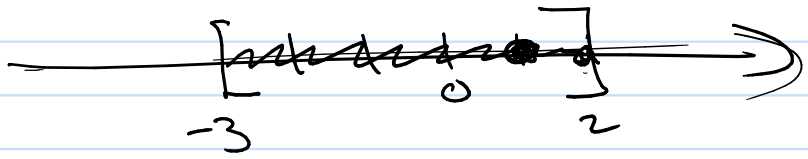


ex $-4 \leq x < 3$



$[-4, 3)$

Sets (putting two together)

S_1 

S_2 

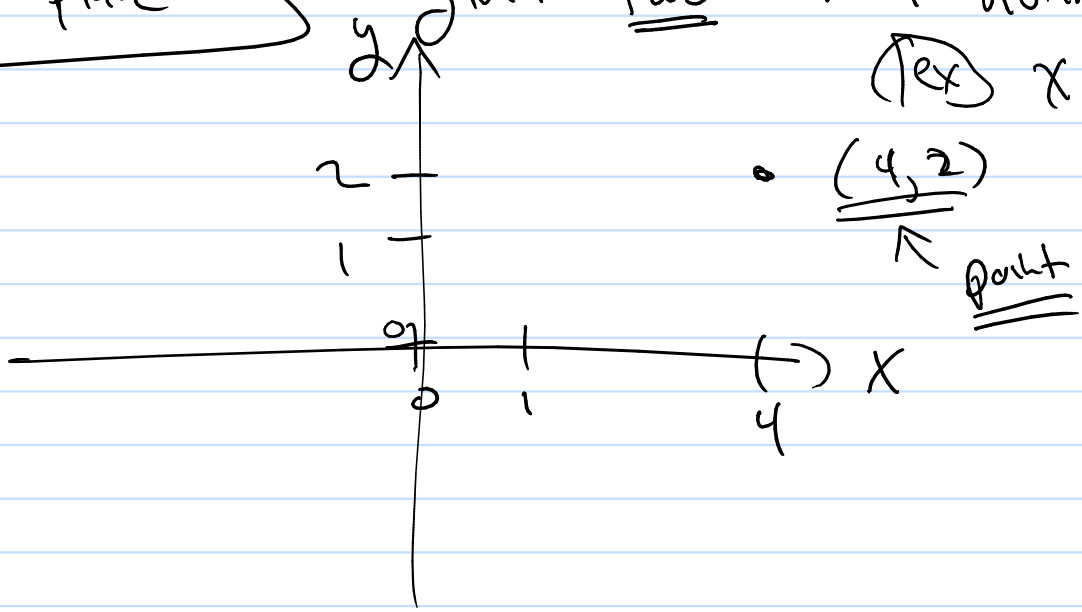
Union (in one set or second set)

$S_1 \cup S_2$ | $[-3, 4]$

Intersection (in one set and second set)

$S_1 \cap S_2$ | $(0, 2]$

Cartesian Plane given two real numbers (ex x, y)



point → place it on the plane

Relationships