

Mathematical Foundations of Data Science

Tutorial 1 (Week 2)

Trimester 1, 2023

1. Let $A = \{1/3, 2/9, -2, 0\}$, $B = \{x \in \mathbb{Q} \mid \frac{3x}{2} \in \mathbb{Z}\}$,
 $C = \{y \in \mathbb{R} \mid 0 < y \leq 3\}$, and $D = \{2, 3, 4, 5\}$.

Describe the following sets:

- (i) $A \cap B$
 - (ii) $A \cup C$
 - (iii) $(C \setminus B) \cap D$
 - (iv) $C \setminus (B \cap D)$
2. How much rain could be collected from the rooftops of houses in Adelaide in one year? How does this compare to the amount of water the population of Adelaide uses in a year? *Try to do as much as possible without using any calculators or Google.*
3. Consider the function

$$f(x) = \begin{cases} |x| & \text{if } -2 < x < 0 \\ \lfloor 2x \rfloor & \text{if } 0 \leq x < 1 \\ 2 & \text{if } 1 < x \leq 2 \end{cases}$$

Sketch the graph of $f(x)$ and find its domain and range.