

**Helpful Overleaf Feature.** If you left double click at a place in the PDF file, then Overleaf indicates the corresponding place in the LaTeX file, making it easy to compare the PDF output to LaTeX input.

Goal: learn the basics about delimiters and sets. Delimiters are often used in describing sets. **Delimiters** are parenthesis-like symbols that enclose something, e.g.:  $\{ , \}$ ,  $( , )$ ,  $[ , ]$ .

Common subsets of Real Numbers

Common subsets of the real numbers are:  $\mathbb{R}$ ,  $\mathbb{N}$ ,  $\mathbb{Z}$ ,  $\mathbb{Q}$ , and  $\mathbb{R} \setminus \mathbb{Q}$ . Enclosing mathy stuff between  $\$$ -signs puts the stuff into *math mode* (instead of the default *text mode*). You could of also expressed the list of subsets as:  $\mathbb{R}$ ,  $\mathbb{N}$ ,  $\mathbb{Z}$ ,  $\mathbb{Q}$ , and  $\mathbb{R} \setminus \mathbb{Q}$ . The PDF outputs look the same but the Latex inputs varies slightly. Common mistakes are to try  $\mathbb{R}$ ,  $\mathbb{N}$ ,  $\mathbb{Z}$ ,  $\mathbb{Q}$ , *and*  $\mathbb{R} \setminus \mathbb{Q}$  or to try  $\mathbb{R}, \mathbb{N}, \mathbb{Z}, \mathbb{Q}$ , and  $\mathbb{R} \setminus \mathbb{Q}$ . Compare the difference in the above 4 Latex inputs. We can also *display* (i.e., center) this list of sets as below

$$\mathbb{R}, \mathbb{N}, \mathbb{Z}, \mathbb{Q}, \text{ and } \mathbb{R} \setminus \mathbb{Q}.$$

The *equation environment* automatically puts us into *math mode* so we do not need the  $\$$  signs.

Delimiters:  $\{ , \}$ ,  $( , )$ ,  $[ , ]$

In LaTeX, only the delimiters  $\{$  and  $\}$  need the backslash (i.e.,  $\backslash$ ) before them, e.g.,  $\{1, 2, 3, 4, \dots\}$ . The other delimiters should not have a backslash before them, e.g.  $(-\infty, \infty)$ . The below delimiters are a bit too short in

$$\left(\frac{1}{2}, \frac{3}{4}\right]$$

so let's fix by

$$\left(\frac{1}{2}, \frac{3}{4}\right].$$

**Warning.** If you use a *leftsome-delimiter*, in order to compile, you need to have a *rightsome-delimiter* after the *leftsome-delimiter*.

Next, let's learn by just looking at some latex input for some subsets of  $\mathbb{R}$ .

$$\{0, \pm 2, \pm 3, \pm 4, \dots\} = \{\dots, -4, -2, 0, 2, 4, \dots\} \quad (1)$$

$$\{2^n \in \mathbb{R} : n \in \mathbb{N}\} = \{2, 4, 8, 16, 32, 64, \dots\} \quad (2)$$

$$\{k^2 \in \mathbb{R} : k \in \mathbb{Z}\} = \{0, 1, 4, 9, 16, 25, 36, \dots\} \quad (3)$$

$$\mathbb{Z} \setminus \mathbb{N} = \{0, -1, -2, -3, \dots\} \quad (4)$$

$$\mathbb{Q} = \left\{ \frac{a}{b} \in \mathbb{R} : a, b \in \mathbb{Z} \text{ and } b \neq 0 \right\} \quad (5)$$

$$\left(\sqrt{2}, \pi\right] = \left\{ x \in \mathbb{R} : \sqrt{2} < x \leq \pi \right\} \quad (6)$$