KIT - International Department GmbH

Pre-Semester Mathematics - Exercises Summer 2010

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1. Exercise:
Let $A = \{0,\ 2,\ 3,\ 3.5,\ 4,\ 6,\ 7,\ 10\}$ and $B = \{n \in \mathbb{N} |\ 1 \leq n \leq 6\}$.
Determine

(a) $A \cup B$,

(b) $A \cap B$,

(c) $A \setminus B$,

(d) the smallest set X, for which $(A \setminus X) \subset B$.

2. Exercise:
Let

$$\begin{aligned} X &= [0,2] \times [2,4] = \{(x,y) |\ 0 \leq x \leq 2,\ 2 \leq y \leq 4\} \\ Y &= \{(x,y) |\ 1 \leq x \leq 3\}, \\ Z &= \{(x,y) |\ x = y\}. \end{aligned}$$

Sketch in the x-y plane these sets and $X \cup Y$, $X \cap Y$, $X \cup Z$, $Y \cap Z$, $(X \setminus Y) \cup (Y \setminus X)$.

3. Exercise:
Compute the following expressions:

(a) $(2+i) \cdot \overline{(3-2i)}$

(b) $\frac{\frac{5}{i}-10}{i-2}$

(c) $\left|\frac{3i-1}{2+6i}\right|$

(d) $\frac{(4-2i)\cdot(5-3i)}{\overline{i\cdot(3i-4)}}$

4. Exercise:
State the domains and ranges of the following real-valued functions of a single real variable and sketch their graphs:

(a) $f(x) = \mathrm{e}^x$

(b) $g(x) = \frac{1}{x}$

Exercises and solutions on the web:
www.tkm.uni-karlsruhe.de/∼kremer/ph10.html