Homework 2

Exercise 1

Fill in the following table. Use ✓ when the set is **closed** and ✗ when the set is not closed:

$(-1,2]$	$(-1,1)$	$[-1,1]$	$\mathbb{R}\backslash\{1\}$	$\{1,2,3\}$	$\mathbb{R}\backslash(0,1)$	$\mathbb{Z}$	$\mathbb{Q}$	$\mathbb{R}\backslash\mathbb{Q}$	$\mathbb{R}$

Prove each statement using the theoretical results from the lectures and seminars.

Exercise 2

Specify the type of the following sets (open or closed). Prove your statements.

$$A = \bigcup_{n\in\mathbb{N}} \left(-1+\frac{1}{n}, 1-\frac{1}{n}\right), \quad B = \bigcup_{n\in\mathbb{N}} \left[-1+\frac{1}{n}, 1-\frac{1}{n}\right]$$

$$C = \bigcap_{n\in\mathbb{N}} \left(-1+\frac{1}{n}, 1-\frac{1}{n}\right) \quad D = \bigcap_{n\in\mathbb{N}} \left[-1+\frac{1}{n}, 1-\frac{1}{n}\right]$$

$$E = \bigcup_{n\in\mathbb{N}} \left[-1-\frac{1}{n}, 1+\frac{1}{n}\right] \quad D = \bigcap_{n\in\mathbb{N}} \left(-1-\frac{1}{n}, 1+\frac{1}{n}\right)$$

Exercise 3

Fill in the following table. Use ✓ when the set is a **neighborhood** of -1 and ✗ when it is not:

$(-1,2]$	$(-2,1)$	$[-1,1]$	$\mathbb{R}\backslash\{1\}$	Z	$\mathbb{R}\backslash(-1,0)$	$\mathbb{Q}$

Prove each statement using the theoretical results from the lectures and seminars.