

**Math 300 Intro Math Reasoning**  
**Worksheet 05: Set Theory**

We define for every  $A \subseteq \mathbb{R}$  and  $r \in \mathbb{R}$

$$A + r = \{a + r \mid a \in A\}$$

(1) Compute (not proof):

- (1)  $\{1, 5\} + 0.5$ .
- (2)  $\mathbb{N} + 1$ .
- (3)  $\mathbb{Z} + 1$ .
- (4)  $\emptyset + r$ .

(2) Prove or disprove:

- (1) If  $A \subseteq B$  then  $A + r \subseteq B + r$ .
- (2) If for some  $r, s \in \mathbb{R}$ ,  $A + r \subseteq B + s$  then  $A \subseteq B$ .
- (3)  $A + 0 = A$

(3) Prove that for every  $r \in \mathbb{R}$ ,  $\mathbb{Q} + r = \mathbb{Q}$  if and only if  $r \in \mathbb{Q}$ .