

MATH 250 HANDOUT 10 - INDEXED UNIONS AND INTERSECTIONS

(1) Write each of the following sets without the \cup, \cap notation.

(a) $\bigcup_{i=1}^{10} \{i\},$ $\bigcap_{i=1}^{10} \{i\}.$

(b) $\bigcup_{i=1}^3 \{i, i + 1\},$ $\bigcap_{i=1}^3 \{i, i + 1\}.$

(c) $\bigcup_{i=1}^3 \{i, \dots, i + 4\},$ $\bigcap_{i=1}^3 \{i, \dots, i + 4\}.$

(d) $\bigcup_{i=1}^{\infty} \{1, \dots, i\},$ $\bigcap_{i=1}^{\infty} \{1, \dots, i\}.$

$$(e) \bigcup_{i=-\infty}^{\infty} \{2i\},$$

$$\bigcap_{i=-\infty}^{\infty} \{2i\}.$$

$$(f) \bigcup_{i=0}^{\infty} (-i, i),$$

$$\bigcap_{i=0}^{\infty} (-i, i).$$

(2) For each of the following sets, if possible, give an alternative description as a single set. If you have extra time, prove your answers.

$$(a) \bigcap_{i=1}^5 p_i \mathbb{Z}, \text{ where } p_i \text{ is the } i\text{th prime. (So, } p_1 = 2, p_2 = 3, \text{ etc.)}$$

$$(b) \bigcap_{n=1}^5 n\mathbb{Z},$$

$$(c) \bigcup_{d \in \mathbb{Z}} d\mathbb{Z};$$

$$(d) \bigcup_{n=1}^{\infty} p_n \mathbb{Z},$$

$$(e) \bigcap_{d \in \mathbb{Z}} d\mathbb{Z};$$

$$(f) \bigcup_{d \in \mathbb{Z}} d\mathbb{Z};$$

$$(g) \bigcup_{i \in \mathbb{R}} (-i, i),$$

$$(h) \bigcap_{i \in \mathbb{R}} (-i, i);$$

$$(i) \bigcap_{i \in \mathbb{R}} [-i, i];$$

$$(j) \bigcap_{i \in \mathbb{Z}_{\geq 1}} [-i, i];$$