

# Review Session 2 Problems

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16 September, 2013

Problems we discussed:

1. Is  $\{\frac{2k+1}{2^n} | k \in \mathbb{Z}, n \in \mathbb{N}\}$  dense in  $\mathbb{R}$ ?

Idea: For  $x \in \mathbb{R}$  and  $\epsilon > 0$ , choose  $n$  such that  $\frac{1}{2^n} < \epsilon/2$ . Then there is  $k'$  such that  $|x - k'/2^n| < \epsilon/2$ . If  $k'$  is odd, we're done. Otherwise, set  $2k + 1 = k' + 1$ . What can we say about  $|x - \frac{2k+1}{2^n}|$ ?

2. Suppose  $n, m \in \mathbb{N}$ ,  $n > m$ . Show  $n - m$  is a natural number.

Idea: Show  $\mathbb{N} = \{1\} \cup \{n \in \mathbb{N} : n - 1 \in \mathbb{N}\}$ . Then fix  $n$  and perform induction on  $m$ .

3. Show  $\sqrt{3} \notin \mathbb{Q}$ .

Idea: See document from 07 September.

We also discussed some homework problems.