

# Title

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## Contents

0.1 Exercises	1
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### 0.1 Exercises

#### Problem 1.

Let  $C$  denote the Cantor set.

1. Show that  $C$  contains point that is not an endpoint of one of the removed intervals.
2. Show that  $C$  is nowhere dense, meager, and has measure zero.
3. Show that  $C$  is uncountable.

#### Solution 1.

1. First we will characterize the endpoints of the removed intervals. Let  $C_n$  be the  $n$ th stage of the deleting process used to define the Cantor set; then what remains is a union of intervals:

$$C_n = [0, \frac{1}{3^n}] \cup [\frac{2}{3^n}, \frac{3}{3^n}] \cup \cdots \cup [\frac{3^n - 1}{3^n}, 1],$$

and so the endpoints are precisely the numbers of the form  $\frac{k}{3^n}$  where  $1 \leq k \leq 3^n$ .