Directions. Please submit your answer to the following problem in a \LaTeX- prepared document. Class participants are encouraged to prepare solutions in a collaborative mode but to prepare their to-be-submitted write-ups individually. The consequences of sharing files, electronic or otherwise, are discussed in the course syllabus.\footnote{If the wording of this problem was discussed in detail in the classroom, the course instructor expects to see similar phrases and sentences in reading the submissions.}

Please include the problem number along with a statement of the problem in your submission. Please also include your e-mail address.

\textbf{Problem.} Let $a_k \in \{0, 1, \cdots 9\}, \ \forall k \in \mathbb{Z}^+, \ \text{with} \ a_{13} = 0$. Prove that there exists a real number in $[0, 1]$ that cannot be represented in the form

$$\sum_{k=1}^{\infty} \frac{a_k}{10^k}.$$\footnote{If the wording of this problem was discussed in detail in the classroom, the course instructor expects to see similar phrases and sentences in reading the submissions.}