平成２６年度
鹿児島大学大学院理工学研究科入学試験（二次募集）
博士前期課程　数理情報科学専攻

英語

平成２６年２月１２日（水）　１０：００－１１：３０

注意.

1. 配布物は，問題冊子 (A4, 3枚)，解答用紙 (B4, 2枚)，草案用紙 (B4, 2枚) である.

2. 試験開始の合図があるまで，問題冊子を開いてはならない.

3. 出題数は 1 , 2 の2題で，2題とも解答せよ.

4. 試験開始後，すべての解答用紙に受験番号を記入せよ.

5. 解答用紙が不足する場合には裏面を使用してもよい.

6. 英和辞書を使用してもよいが，電子辞書の使用は認めない.

7. 問題冊子と草案用紙は持ち帰ること.

1 次は A. Zeman と K. Kelly の共著 "Everything you need to know about Math Homework"(Scholastic, 2004) から一部を抜粋したものである．全訳せよ．

Blaise Pascal (1623-1662) was a French mathematician and scientist. In 1642, at age 19, he invented the first calculator for adding and subtracting. Unlike the abacus, Pascal's calculator was very expensive and difficult to make. It never caught on. Then in 1671, Gottfried Wilhelm Leibniz invented a calculator that could multiply and divide numbers. Leibniz's machine was also expensive and complicated. Like Pascal's calculator, it never caught on.

Charles Babbage (1792 -1871) began work in 1823 on a calculating machine that would solve arithmetic problems and then print out the answers. The machine was run with gear wheels. It was slow. It was so complicated that Babbage died before he finished building it.

(中略)

The first electronic computers were built in the early 1900s. They were used mostly in wartime to break enemy codes.

Computers were enormous, expensive machines. They had to be kept in very large, refrigerated rooms. They were sold mostly to governments and businesses and were much too big and expensive for home use.

注意

- Blaise Pascal：ブレーズ・パスカル
- Gottfried Wilhelm Leibniz：ゴットフリート・ウィルヘルム・ライプニッツ（ドイツの数学者，哲学者）
- Charles Babbage：チャールズ・バベッジ（イギリスの数学者，計算機科学者）

2 次は Wilson A. Sutherland 著 "Introduction to Metric & Topological Spaces" (Oxford University Press, 2009) から一部を抜粋したものである．全訳せよ．ただし，$\mathbb{R}$ は実数全体の集合であって，$\mathbb{R}^2$ は平面である．

It is intuitively clear that $\mathbb{R}$ and $\mathbb{R}^2$ are not homeomorphic. Here is one way to prove this: suppose for a contradiction that $f : \mathbb{R} \longrightarrow \mathbb{R}^2$ is a homeomorphism. Then by Exercise 10.10, f induces a homeomorphism $f \mid \mathbb{R}\backslash\{0\} : \mathbb{R}\backslash\{0\} \longrightarrow \mathbb{R}^2\backslash\{f(0)\}$. But $\mathbb{R}\backslash\{0\}$ is not connected whereas $\mathbb{R}^2$ with a point removed is path-connected and hence connected. This is a contradiction by Corollary 12.12, so $\mathbb{R}$ and $\mathbb{R}^2$ are not homeomorphic.

We can argue similarly in many cases. For another example, the interval $I = [0,1]$ and the circle $S^1 = \{(x,y) \in \mathbb{R}^2 \mid x^2 + y^2 = 1\}$ are not homeomorphic. For suppose there were a homeomorphism $f : I \longrightarrow S^1$. Then there would be an induced homeomorphism of $[0,1/2) \cup (1/2,1]$ to $S^1\backslash\{f(1/2)\}$. But the first of these two spaces is disconnected whereas S^1 with a point removed is path-connected hence connected.