平成２２年度入学大学院入学試験問題
英語
２０１０年2月１５日（１０時～１１時３０分)

1 次は S. Katz 著 "Enumerative Geometry and String Theory" からの抜粋である．全文を和訳せよ．ただし，数式はそのまま書けばよい．

"How many roots does a polynomial of degree n in one variable have?"

For this problem, there is again a range of subcases, revealing a range of potential difficulties. Let's consider a polynomial of degree d

$$f(x) = a_0x^d + a_1x^{d-1} + \cdots + a_{d-1}x + a_d,$$

for the moment with real coefficients a_i, and solve $f(x) = 0$.

(中略)

The situation already gets much richer if $d = 2$. The quadratic formula gives

$$x = \frac{-a_1 \pm \sqrt{a_1^2 - 4a_0a_2}}{2a_0}.$$

There are now several possibilities:

(1) $a_0 \neq 0$. There are several well-known subcases. Let $D = a_1^2 - 4a_0a_2$ be the discriminant of $f(x)$.

  (a) $D > 0$. There are two roots.

  (b) $D < 0$. There are no real roots.

  (c) $D = 0$. There is one root.

(2) $a_0 = 0$. There are several possibilities:

  (a) $a_1 = 0$. In this case, there are no solutions (unless additionally $a_2 = 0$, in which case there are infinitely many roots).

  (b) $a_1 \neq 0$. There is now exactly one solution $x = -\frac{a_2}{a_1}$.

注: potential 潜在的な, additionally さらに, infinity 無限大

2 次の英文は J. Munkres 著 "Topology"からの抜粋である. 全文を和訳せよ. ただし, 数式はそのまま書けばよい.

How does one go about specifying a set? If the set has only a few elements, one can simply list the objects in the set, writing "A is the set consisting of the elements $a, b,$ and c." In symbols, this statement becomes

$$A = \{a, b, c\},$$

where braces are used to enclose the list of elements.

The usual way to specify a set, however, is to take some set A of objects and some *property* that elements of A may or may not posses, and to form the set consisting of all elements of A having that property. For instance, one might take the set of real numbers and form the subset B consisting of all even integers. In symbols, this statement becomes

$$B = \{x \mid x \text{ is an even integer}\}.$$

Here the braces stand for the word "the set of," and the vertical bar stands for the word "such that." The equation is read "B is the set of all x such that x is an even integer."

注: set 集合, object 要素, element 要素