Practice 1

Question 1. Fill in each blank with a suitable word. Some words are given in the following box.

approaches / area / bounded / conjugate / continuous / differentiable / equal / equals / form / graph / infinite / infinitely / maximum / minimum / modulus / satisfying / satisfies / second / slope / tend / volume

a) The function f is continuous at some point c of its domain if the limit of $f(x)$ as x . . . . c exists and is . . . . to $f(c)$.

b) If the real-valued function f is . . . . on the closed interval $[a,b]$ and k is some number between $f(a)$ and $f(b)$, then there is some number c in $[a,b]$ such that $f(c)=k$.

c) If a function f is defined on a closed interval $[a,b]$ and is continuous there, then the function attains its . . . ., i.e. there exists $c \in [a,b]$ with $f(c) \leqslant f(x)$ for all $x \in [a,b]$.

d) The definite integral $\int_a^b |f(x)|dx$ is equal to the . . . . of the region in the xy–plane bounded by the . . . . of f, the x–axis, and the vertical lines $x=a$ and $x=b$.

e) For a real-valued function of a single real variable, the derivative at a point equals the . . . . of the tangent line to the graph of the function at that point.

f) Let f be a . . . . function, and let $f'(x)$ be its derivative. The derivative of $f'(x)$ (if it has one) is written $f''(x)$ and is called the . . . . derivative of f.

g) On the real line, every polynomial function is . . . . differentiable.

h) A complex number is a number that can be expressed in the . . . . $a+ib$, where a and b are real numbers and i is the imaginary unit, ... $i^2=-1$.

i) The complex . . . . of the complex number $z=x+yi$ is defined to be $x-yi$.

j) The . . . . of a complex number $z=x+yi$ is $r=\sqrt{x^2+y^2}$.

Question 2. Translate the following paragraphs into Vietnamese.

a) A group is a non-empty set G with one binary operation $(a,b)\mapsto ab$ that satisfies the following axioms (the operation being written as multiplication):

1) the operation is associative, i.e. $(ab)c=a(bc)$ for any a, b and c in G;
2) the operation admits a unit, i.e. G has an element e, known as the unit element, such that $ae=ea=a$ for any a in G;
3) the operation admits inverse elements, i.e. for any a in G there exists an element x in G, said to be inverse to a, such that $ax=xa=e$.

It follows from this definition that the unit element in any group is unique, that the element inverse to any given element in the group is unique.

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b) The theory of groups studies in the most general form properties of algebraic operations which are often encountered in mathematics and their applications; examples of such operations are multiplication of numbers, addition of vectors, successive performance (composition) of transformations, etc. The concept of a group is historically one of the first examples of abstract algebraic systems and served, in many respects, as a model for the restructuring of other mathematical disciplines at the turn into the 20th century, as a result of which the concept of a mathematical system (a structure) has become a fundamental concept in mathematics.

c) A complex number is a number of the form $z = x + iy$, where x and y are real numbers and $i = \sqrt{-1}$ is the so-called imaginary unit, that is, a number whose square is equal to -1 (in engineering literature, the notation $j = \sqrt{-1}$ is also used). x is called the real part of the complex number z and y its imaginary part (written $x = \mathrm{Re} z$, $y = \mathrm{Im} z$). The real numbers can be regarded as special complex numbers, namely those with $y = 0$. Complex numbers that are not real, that is, for which $y \neq 0$, are sometimes called imaginary numbers. The complicated historical process of the development of the notion of a complex number is reflected in the above terminology which is mainly of traditional origin.

Algebraically speaking, a complex number is an element of the (algebraic) extension $\mathbb{C}$ of the field of real numbers $\mathbb{R}$ obtained by the adjunction to the field $\mathbb{R}$ of a root i of the polynomial x^2+1. The field $\mathbb{C}$ obtained in this way is called the field of complex numbers or the complex number field. The most important property of the field $\mathbb{C}$ is that it is algebraically closed, that is, any polynomial with coefficients in $\mathbb{C}$ splits into linear factors. The property of being algebraically closed can be expressed in other words by saying that any polynomial of degree $n \geqslant 1$ with coefficients in $\mathbb{C}$ has at least one root in $\mathbb{C}$ (the d'Alembert-Gauss theorem or fundamental theorem of algebra).

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Question 3. Translate the following sentences/paragraphs into English.

a) Giả sử A là một tập hợp khác rỗng. Mỗi ánh xạ $f : A \times A \to A$ được gọi là một phép toán hai ngôi trên A.

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b) Mỗi đa thức bậc n $(n \geqslant 1)$ với hệ số phức có đúng n nghiệm phức (tính cả bội).

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c) Phép toán hai ngôi $(a, b) \mapsto ab$ trên tập hợp A được gọi là có tính chất giao hoán nếu $ab = ba$ với mọi a, b trong A.

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d) Giả sử X là một tập hợp khác rỗng. Ánh xạ $d : X \times X \to \mathbb{R}$ được gọi là một metric trên X nếu nó thoả mãn các tính chất sau đây

(i) $d(x, y) \geqslant 0$, với mọi $x, y \in X$, và $d(x, y) = 0 \Leftrightarrow x = y$;

(ii) $d(x, y) = d(y, x)$ với mọi $x, y \in X$;

(iii) $d(x, y) \leqslant d(x, z) + d(z, y)$ với mọi $x, y, z \in X$ (bất đẳng thức tam giác).

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e) Cho tam giác ABC có trung điểm các cạnh AB, BC, CA lần lượt là $M(-1; -1)$, $N(1; 9)$, $P(9; 1)$.

1) Lập phương trình các cạnh của tam giác.
2) Lập phương trình các đường trung trực của tam giác.
3) Tìm toạ độ tâm đường tròn ngoại tiếp tam giác ABC.

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