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“Algebraic and Geometric Methods of Analysis”

Book of abstracts



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LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric problems in mathematical analysis
- Geometric and topological methods in natural sciences
- History and methodology of teaching in mathematics

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ФІТБ ОНАФТ

The construction of squaring the circle

Veselin Rmuš

(Ministry of Education, 84300 Berane, Montenegro)

E-mail: veselinrmus12@gmail.com

The paper contains the original method for the construction of squaring the circle, one of the famous Greek problems more than 25 centuries old, known to be unsolvable by using only a ruler and compass. The solution of the problem is possible if the diameter of the given circle is divided by a point using the Thales theorem on proportional length in and the ratio of large real numbers. The process of solving the above-mentioned problem relies on the Euclidean geometry and contains a description of the construction, construction, proof, and discussion. The construction leading to the solution of the problem is based on the assumption that the tools (instruments) are perfectly precise and that the solution is completed if used a finite number of times.

The proof contains two derived formulas in accordance with the rules of Numerical analysis, combined into a single (universal) formula which can be used in practice. In discussion the conditions on which the problem can be solvable, as well as number of solutions are given.

1. Squaring the circle using only a straightedge and compass is possible

Description of construction:

A given circle with a central point O and radius r are denoted by $k(O, r)$. The length AB is diameter of an arbitrary circle k . (Fig.1) As shown by the previous method, when constructing of the length $X = \sqrt{2}$, we divide diameter AB by the point C in the ratio of integers 11000000 and 3005681, i.e. $AC : CB = 11000000 : 3005681$,

in the following way:

On the arbitrary ray A_q we determine point M by "transferring" 11000000 arbitrary unit lengths. Then we determine the point N so that the length MN equals 3005681 arbitrary unit lengths.

Then we construct a length NB . Through the point M we draw a line s parallel to the length NB . The intersection of the line s and length AB is denoted by C . Through the point C we construct the line l so that it is parallel to the ray A_q and its intersection with the length NB we denote by the point L . (Fig. 1) The length AB is divided in the above mentioned ration by the point C .

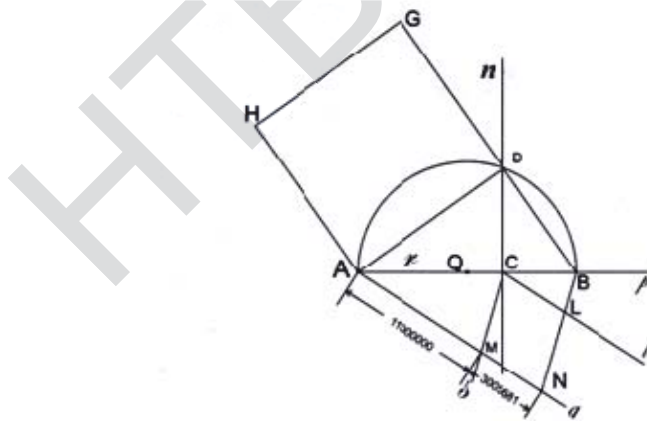


Fig.1

Triangles AMC and CLB are similar, so we can form the proportion:

$$AC : AM = CB : CL \dots (3)$$

Based on relation (3), we replace:

$$AM = 11 \cdot 106 \text{ and } MN = CL = 3005681 = 3,005681 \cdot 106$$

It follows that $AC : CB = 11 \cdot 10^6 : 3,005681 \cdot 10^6$, Q.E.D. (Quod erat demonstrandum)

After having it shortened with 106, we get:

$$AC : CB = 11 : 3,005681 = t \dots (4)$$

Based on relation (4) $AC : 11 = t \Rightarrow AC = 11t$ and

$$CB : 3,005681 = t \Rightarrow CB = 3,005681t \dots (5),$$

where t is a non-negative real number, i.e. $t > 0$ and $t \in R$.

Let us construct a line n through the point C to be perpendicular to the diameter AB , and denote its (one) intersection with the periphery of the circle by D . Then we draw lengths AD and BD . AD represents the side of the square whose area is equal to the area of the given circle. Then we construct the square $ADGH$ (Figure 1).

Mokritskaya T. P., Tushev A. V. <i>On some fractal-based estimations of subsidence volume for various types of soils</i>	39
Mukhamadiev F. G. <i>The Shanin number and the predshanin number of N_{τ}^{φ}-kernel of a topological spaces</i>	41
Najmiddinov J. Sh. <i>The effectiveness of the use of computer programs in the teaching of mathematics in academic lyceums</i>	42
Obikhod T. <i>Gromov-Witten invariants and identification of the energy levels of solitonic states</i>	43
Ostrowska O., Yakymiv R. <i>On isometries satisfying deformed commutation relations</i>	45
Prishlyak A., Prus A. <i>Three-color graph of the Morse flow on a compact surface with boundary</i>	46
Pulemotov A. <i>The Ricci Iteration on Homogeneous Spheres</i>	48
Rmuš V. <i>The construction of squaring the circle</i>	49
Samokhvalov S. <i>Riemann-Klein antagonism and problem of energy in general relativity</i>	51
Savchenko A. <i>On generalized spaces of persistence diagrams</i>	52
Sazonova O. <i>Continual approximate solution with acceleration and condensation mode</i>	53
Serdyuk A. S., Sokolenko I. V. <i>Approximation by Fourier sums and interpolation trigonometric polynomials in classes of differentiable functions with high exponents of smoothness</i>	54
Serdyuk A., Stepanyuk T. <i>Lebesgue-type inequalities for the Fourier sums</i>	57
Skuratovskii R. <i>Minimal generating set and structure of wreath product of cyclic groups, comutator of wreath product and the fundamental group of orbit Morse function $\pi_1 O(f)$</i>	59
Vasilchenko A. <i>Spaces of primitive elements in dual modules over Steenrod algebra 2</i>	61
Morrison P. J. <i>A Geometrical Version of the Maxwell-Vlasov Hamiltonian Structure</i>	63
Wojtowicz M. <i>Note on congruent numbers</i>	64
Кадубовський О. А. <i>Про число топологічно нееквівалентних гладких функцій з однією критичною точкою типу сідла на двовимірному торі</i>	65
Ладиненко Л. П. <i>Щодо геометричної характеристики спеціальних майже геодезичних перетворень просторів афінного зв'язку зі скрутом</i>	67
Овчаренко О. О. <i>Життєвий та науковий шлях Марка Григоровича Крейна</i>	68
Подоусова Т. Ю., Вашпанова Н. В. <i>LGT-лінії та A-деформації мінімальних поверхонь</i>	69
Прокіп В. М. <i>Алгоритм побудови унітального дільника для многочленної матриці</i>	70
Синюкова О. <i>Про геодезичні відображення просторів дотичних розшарувань зі спеціальною метрикою</i>	72
Щеглов М. В. <i>Поточкова оцінка відхилення полінома Крякіна від неперервної на відрізку функції</i>	73