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FUSIONISM OF ALGEBRAIC AND GEOMETRICAL METHODS

Fusionism (from Latin "Fusion" – merging) is a qualitative unity of algebraic and geometrical material. Just like this in XIX century the common teaching of different subjects was called.

The ideas of fusionism approach to the study of mathematics can be found in the works of an Asian scholar of the eleventh century Ibn Sina (980 – 1037). Though fusionism of algebraic and geometrical methods was met much earlier, in the works of the Pythagorean school, whose main achievement in this direction was the creation of geometrical algebra.

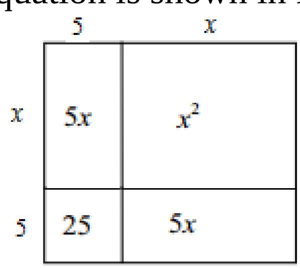
Geometrical algebra was based on ancient plane geometry that was represented by a geometry of a compasses and ruler. So it was maximally adjusted for research of identities, both parts of which are quadratic forms, and for solving quadratic equations [1, p. 79].

Let's consider *the task of al-Khwarizmi*. To solve the equation $x^2 + 10x = 39$.

Al-Khwarizmi formulates this task as follows: "The square of the unknown and the ten unknown are 39 dirhams (Dirham is a silver coin of the medieval East). What is the unknown?" [7, c. 170]

Geometrical solution of the equation is shown in Fig. 1

Fig. 1



We build a square with the side of x and finish building of two rectangles with sides of x and 5. The figure obtained is called a "gnomon". We add this gnomon to the square with the side of $x + 5$. Then area of the built square I s $S = (x + 5)^2$.

According to Fig. 1 we determine $S = x^2 + 2 \cdot 5x + 25 = x^2 + 10x + 25$. We have a $(x + 5)^2 = x^2 + 10x + 25$. According to the task $x^2 + 10x = 39$, hence: $(x + 5)^2 = 39 + 25 = 64$, $x + 5 = 8$, $x = 3$.

Using algebraic equations, unsolvability of famous tasks of geometry (squaring a circle, doubling a cube and trisection of an angle) is proven by means of compasses and ruler. In this research an attempt is made to solve algebraic tasks by means of geometrical methods and vice versa.

Let's consider *Wallis's task*. Prove that the square has the largest area of the rectangles with the same perimeter [2, c. 40].

Solving. We apply the derivative for research of functions $S(x) = (2a - x)x$ on a maximum. $S(x) = 2ax - x^2, S'(x) = 2a - 2x = 0, x = a$.

As $S''(x) = -2,\ S''(a) = -2 < 0$, then $x = a -$ is a point of maximum, and $\max S(x) = S(a) = a^2$. The sides of the rectangle are $x = a$ and $2a - x = a$, that is, the rectangle with the largest area is a square.

Thus, we considered the interpenetration of geometrical methods and characters into algebra and vice versa. We also studied geometrical interpretation of algebraic dependences and analytical interpretation of geometrical facts. The idea of fusionism in mathematics is quite elegant and innovative in relation to the traditional system of the successive teaching of mathematics. The traditional solving of some mathematical tasks foresees bulky calculations, but usage of fusionism of algebraic and geometrical methods facilitates their solving and proving.

LITERATURE

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