THE EFFECT OF USING THE GEOGEBRA PROGRAM IN CALCULATING THE SURFACES OF SHAPES USING THE DEFINITE INTEGRAL.

Solayeva Mehribon Norimonovna
University of World Economy and Diplomacy,
Teacher of the "Systematic analysis and mathematical modeling" department.
m.solayeva@uwed.uz, mehribon.solayeva@bk.ru
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Abstract: In this article, the problems leading to the concept of the definite integral of a function, the use of the "Geogebra" program to find the shape surface of a bounded interval of the function using the definite integral, and the calculation of the shape surfaces bounded by two functions are briefly discussed.

Key words: Definite integral, function, curved trapezoid surface, "Geogebra" program.

MAIN PART

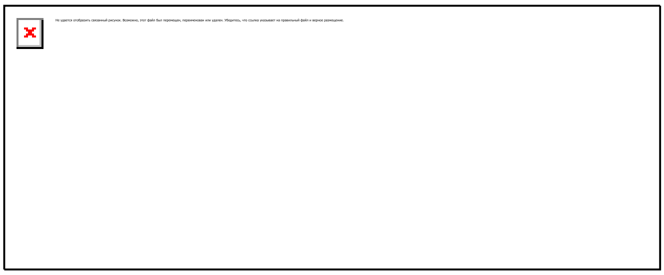
As we know from mathematical analysis or higher mathematics, which are subjects of mathematics, physics, engineering, economics and other areas of higher education, the concept of definite integral of a function comes from finding the surface of the form bounded by the graph of the function in a certain interval. came out [3,4]

The definite integral of a function is also found and defined by dividing the given interval into slices and finding the surfaces of the shape in that slice to find the surface of the curved trapezoid bounded by the graph of the function on a given interval and calculating the sum of the surfaces of all the slices.[1,2,3]

We will briefly discuss below a few formulas used in the calculation of curved trapezoidal surfaces bounded by function graphs and the benefits and applications of the Geogebra program in their use.

Let's assume, $f(x) \in C[a,b]$ being $\forall x \in [a,b]$ at $f(x) \geq 0$ let it be.

Upper $f(x)$ unction graph, from the sides $x = a$, $x = b$ bounded by vertical lines and the abscissa axis from below Q look at the shape. (Chart 1)[1,2]



Drawing 1

Usually, this shape is called a curved trapezoid. $[a,b]$ segment is optional

Q face of a curved trapezoid

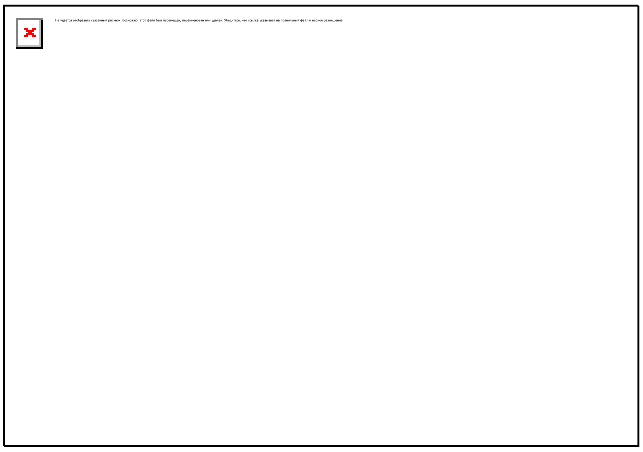
$$\mu(Q) = \int_a^b f(x)dx$$

will be equal to

In the plain Q the form is as follows

$$y=f_1(x)\quad , \quad y=f_2(x)\quad , \quad x=a\quad , \quad x=b$$

represent the shape bounded by lines (diagram 2)



Drawing 1

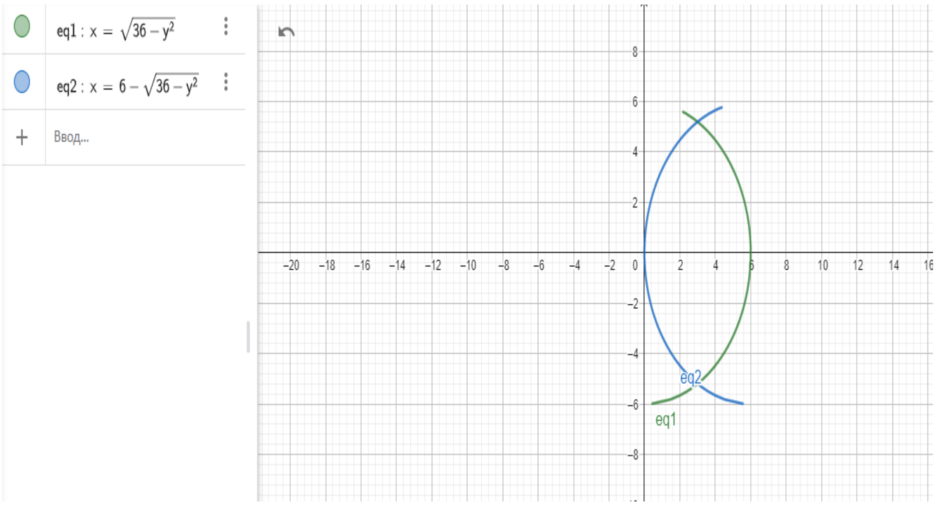
This is the face of the form

$$\mu(Q)=\int_a^b f_2(x)dx-\int_a^b f_1(x)dx=\int_a^b [f_2(x)-f_1(x)]dx$$

will be.

Ex 1: $x=\sqrt{36-y^2}$, $x=6-\sqrt{36-y^2}$. find the surface of the shape bounded by the functions.[1,3]

Solution: *First of all, before finding the surface of the shape bounded by these functions, we draw the graphs of the functions using the "Geogebra" program in order to have a more complete understanding of the shape whose surface should be found.*



Now we calculate the surface of the part above the OX axis of this shape and multiply it by 2. For this, we find the coordinates of the points of intersection of two functions and the points of intersection of the OX axis.

$\sqrt{36-y^2}=6-\sqrt{36-y^2}$ we solve the equation.

$$\sqrt{36-y^2}=3$$

$$36-y^2=9 \Longrightarrow y^2=27 \Rightarrow y=\pm 3\sqrt{3}$$

Now we calculate the following integral.

$$\int_0^{3\sqrt{3}}\left(\sqrt{36-y^2}-6+\sqrt{36-y^2}\right)dy=\int_0^{3\sqrt{3}}\left(2\sqrt{36-y^2}-6\right)dy$$

We introduce notations for calculating the integral.

$$y = 6sin\alpha, dy = 6cos\alpha\ d\alpha, \sqrt{36 - y^2} = 6cos\alpha$$

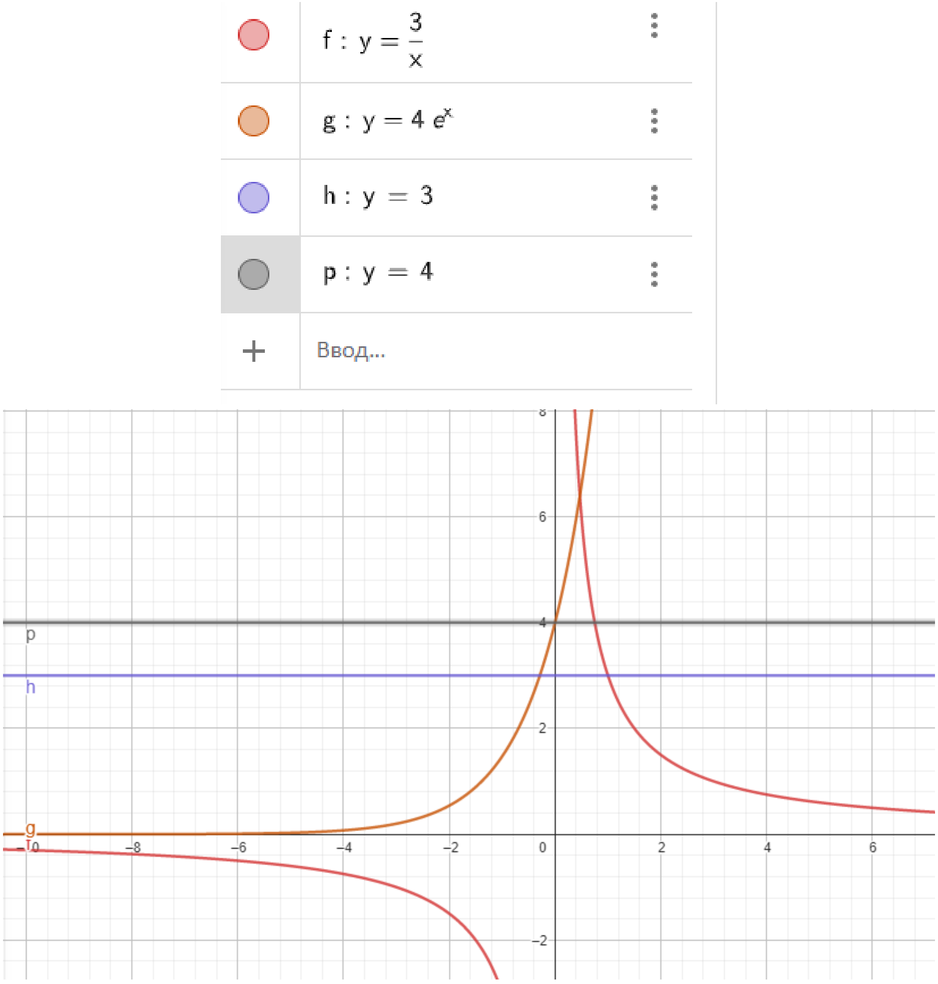
$$y = 0 \Rightarrow \alpha = 0, y = 3\sqrt{3} \Rightarrow \alpha = \frac{\pi}{3}$$

Now let's calculate all the notations in the definite integral.

$\int_0^{3\sqrt{3}}(2\sqrt{36 - y^2} - 6)dy = \int_0^{\frac{\pi}{3}}(12cos\alpha - 6) \cdot 6cos\alpha\ d\alpha = 36\int_0^{\frac{\pi}{3}}(2cos\alpha^2 - cos\alpha)\ d\alpha = 12\pi - 9\sqrt{3}$ equality will come. Now we multiply the derived value by 2 to find the full value of the definite integral. That is, the face of the given form $S = 12\pi - 9\sqrt{3}$ it follows that is equal to

Ex 2: $y = \frac{3}{x},\ y = 4e^x,\ y = 3,\ y = 4$. *find the face of the figure bounded by the lines.[1]*

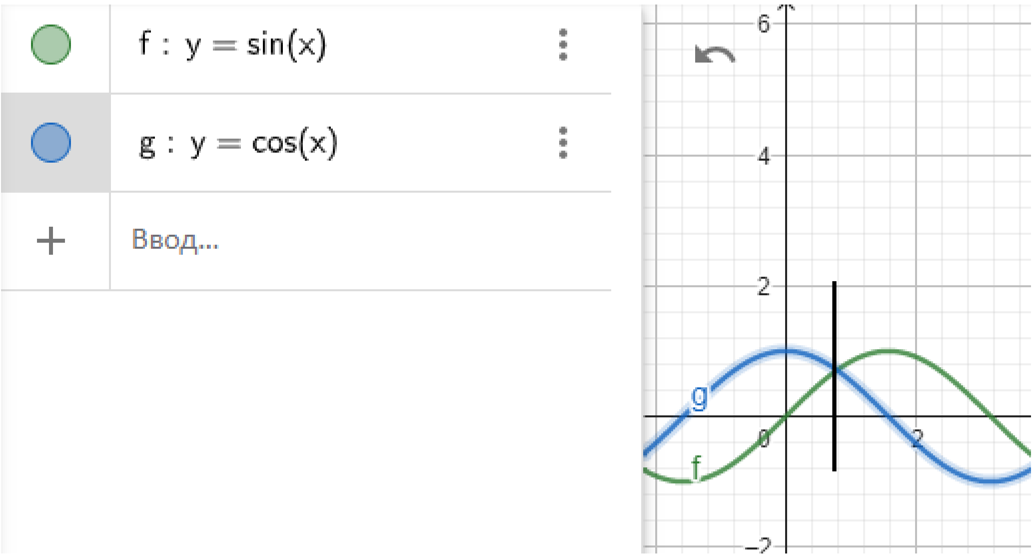
Solution:



$$\int_{\ln\frac{3}{4}}^{0}(4e^x - 3)dx + \int_0^{\frac{3}{4}}(4 - 3)dx + \int_{\frac{3}{4}}^{1}\left(\frac{3}{x} - 3\right)dx = (4e^x - 3)\Big|_{\ln\frac{3}{4}}^{0} + x\Big|_0^{\frac{3}{4}} + (3\ln x - 3x)\Big|_{\frac{3}{4}}^{0} = 1$$

Ex 3: $y = \sin x,\ y = \cos x,\ x = 0\ (x \geq 0)$. $x \leq \pi$ find the surface of the shape bounded by the functions.[1]

Solution:



We divide the given interval into two parts as shown in the picture. Now we calculate the integrals in these intervals.

$$\int_0^{\frac{\pi}{4}}(cosx-sinx)dx+\int_{\frac{\pi}{4}}^{\pi}(sinx-cosx)dx=(sinx+cosx)\Big|_0^{\frac{\pi}{4}}+(-cosx-sinx)\Big|_{\frac{\pi}{4}}^{\pi}=2\sqrt{2}$$

Conclusion: In conclusion, we say that the use of various programs in improving the quality of education and the effectiveness of the lesson, in the organization of certain parts of the subjects of mathematical education, gives effective results. In addition, through programs designed to draw graphs of functions, such as "Geogebra", students will have the opportunity to imagine and analyze the solution of the given problem. Through this, it is possible not only to improve the quality of education, but also to achieve a full understanding of the issue and its essence.[5,6]

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