UDC 51:37:016

CONTINUITY ON EXAMPLE OF THE FUNCTION GIVEN IN PARAMETRIC FORM

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Recent times educational research regarding the dynamics of the development of mathematics content is noticed twofold process. On the one hand, without the extra hours in school mathematics included a number of new topics and on the other hand, higher mathematics repeats a certain content of school mathematics in the same amount.

The solution to this problem can be practiced on the interaction basis of school and university education, and above all, to ensure the continuity of the content of mathematics.

In particular, the function $y = f(x)$ explicitly set well researched and sketched. However one correspondence between the variables makes it impossible to describe certain curves in arbitrary locations on the plane. Also, the curve cannot be closed.

At the same time-one correspondence between the variables makes it impossible to describe some curves at random locations on the plane. Also, the curve cannot be closed. In such cases, the dependence is convenient to describe by parametric function, which is more diverse than it allows explicit functions.

If x(t) and y(t) defined for $t \in (a; b)$ and exists an inverse function $t = \theta(x)$ for x(t), this is called a parametric specification of the function $y(\theta(x))$ [1, 2].

By following Israel Gel'fand's saying: "Theories come and go, but the examples remain" proceed to consider next example.

Example. Construct the curve given in parametric form [3]:

$$\begin{cases} x = a\cos 2t \\ y = a\cos 3t \end{cases}, \quad (a>0)$$

Decision. Since $x(\pi + t) = x(t)$ and $y(\pi + t) = -y(t)$, we note that $t \in [0; \pi]$. Compute the derivatives:

$$y'_x = \frac{dy}{dx} = \frac{3\sin 3t}{2\sin 2t} \quad \text{and} \quad y''_{xx} = \frac{d(y')}{dx} = \frac{3\sin t(\cos 3t \cos t - 1)}{-2a\sin \sin^3 2t}.$$

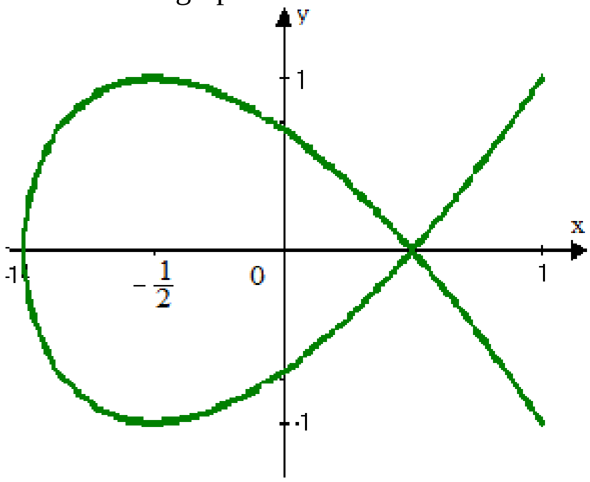
Find the critical points, in each of the intervals whose boundaries are the critical points, we define the sign of the derivative y'_x and the intervals of increase and decrease of the function y(x), given parametrically.

We define an inflection point, convex and concave intervals bounded by the inflection points or the points at which the second derivative does not exist. All results are written in the table (Note. The table and figure a = 1).

t	$\left(0; \frac{\pi}{3}\right)$	$\left(\frac{\pi}{3}; \frac{\pi}{2}\right)$	$\left(\frac{\pi}{2}; \frac{2\pi}{3}\right)$	$\left(\frac{2\pi}{3}; \pi\right)$
x(t)	$\left(1; -\frac{1}{2}\right)$	$\left(-\frac{1}{2}; -1\right)$	$\left(-1; -\frac{1}{2}\right)$	$\left(-\frac{1}{2}; 1\right)$
y(t)	(1; -1)	(-1; 0)	(0; 1)	(1; -1)
y'_x	$y' > 0$, i.e. function is increases	$y' < 0$, i.e. function is decreases	$y' > 0$, i.e. function is increases	$y' < 0$, i.e. function is decreases

y''_{xx}	$y' > 0$, i.e. function is concave	$y' > 0$, i.e. function is concave	$y' < 0$, i.e. function is convex	$y' < 0$, i.e. function is convex

From these data, we can construct a graph of the function



Yes, we do not exclude the possibility of using good software, but this is an important process of research, development of intellectual activity of the student, in particular, feel the skill function.

In the implementation continuity of the content of mathematics, in our opinion, is the following reasoning: in school mathematics content included (if it need them) that the university will not require renewed examination and relying on it to study the next levels.

Literature

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