Ещё одно условие для запуска транспортного средства на маршрут можно определить следующим образом:

$$\lambda_{нитр} * t_{доезда} \le (1 - a_{нитр}) * V \,.$$

Данный подход к функционированию системы городского общественного транспорта позволяет повысить эффективность транспортных средств на маршруте, оптимизировать забор и высадку пассажиров для более полного удовлетворения потребностей клиентской стороны, уменьшить затраты из городского бюджета.

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APPLET FOR TAYLOR SERIES

The professional language of mathematical symbols and formulas is often incomprehensible to students, especially those who have not studied in physics and mathematics classes. The inability to imagine and see mathematical objects in reality creates certain difficulties in mastering the course of mathematics. Visualization of mathematical material, from our point of view, will help to facilitate the understanding of mathematics and improve the quality of knowledge in this discipline.

In the course of studying mathematics in the first year, we came across the concept of «Taylor series» and thought about how to depict this series. We'd like to introduce you our program, which makes graphs for four trigonometric functions using Taylor series and we should start with basic concepts.

What is a Taylor series?

Definition The Taylor series at point a of a function $f(x)$ of a real variable x, infinitely differentiable in the neighborhood of point a, is called a sum of the form:

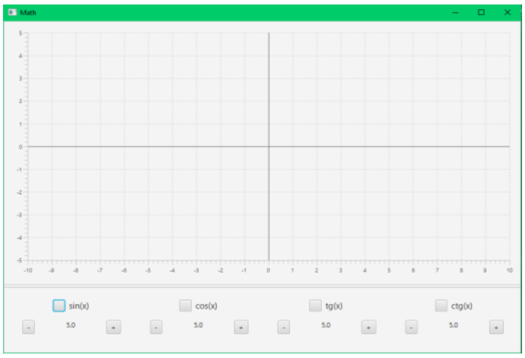
$$f(x) = f(a) + \sum_{k=1}^{\infty} \frac{f^{(k)}(a)}{k!} \; x - a^{\;k} \,.$$

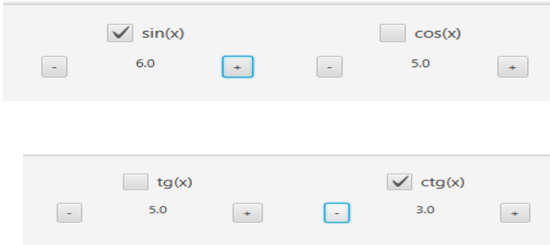
In other words, The Taylor series is a decomposition of a function into an infinite sum of power functions.

We have written a program that will build decompositions of some functions into a Taylor series depending on the number of Taylor series members and will allow you to compare the graph of the function itself with the graph of the Taylor series that approximates this function.

To create our project, we used the Java programming language. The applet consists of four main files, that are interconnected and make our program work.

The first file **«Main»** is a file that opens our program and shows us the initial window (see Picture 1).



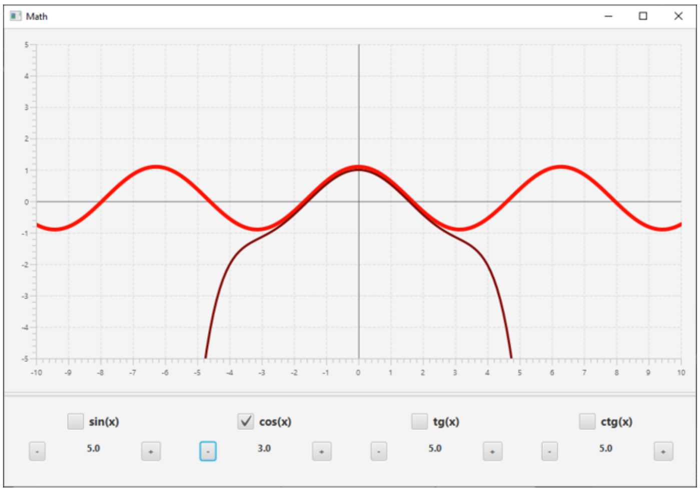


Picture 1 – Initial window of the applet

Picture 2 – Taskbar for selecting a function

The second file **«Controller»** is responsible for pressing buttons in the program, in other words it let us choose function, for which we'd like to build a graph, and change the number of terms in the series (see Picture 2).

The third file **«MyGraph»** is responsible for making plots for chosen function. Depending on the chosen by user number of terms it generates Taylor series for this function, calculates several points and plot them in our window (see Picture 3).



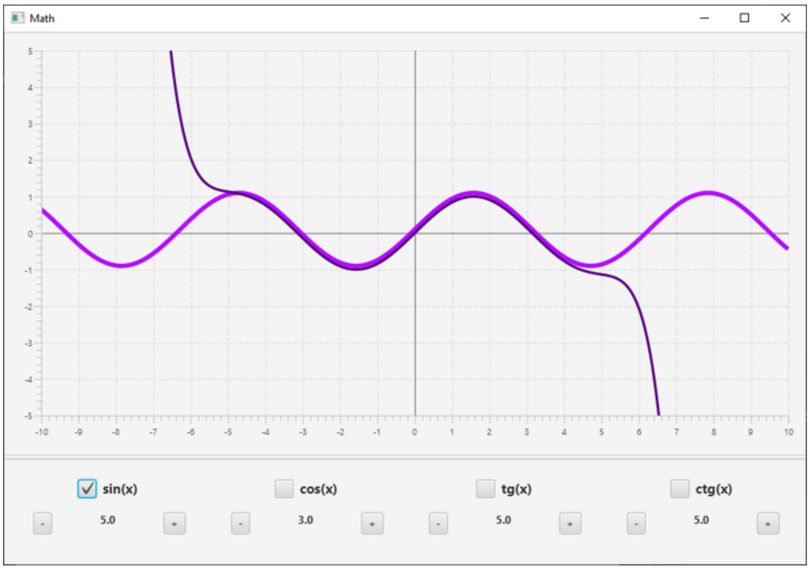
Picture 3 – Graph of the function $y = \cos x$ ***and its Taylor series with three terms***

The fourth file **«Sample»** is a file that is responsible for the interface of our program. It locates all buttons, checkboxes and fields and, unlike other files, have the .fxml file extension.

Here are some examples of how the developed application works.

First of all we see the default window where all $n = 5$, where n is the number of terms of Taylor series (see Picture 1).

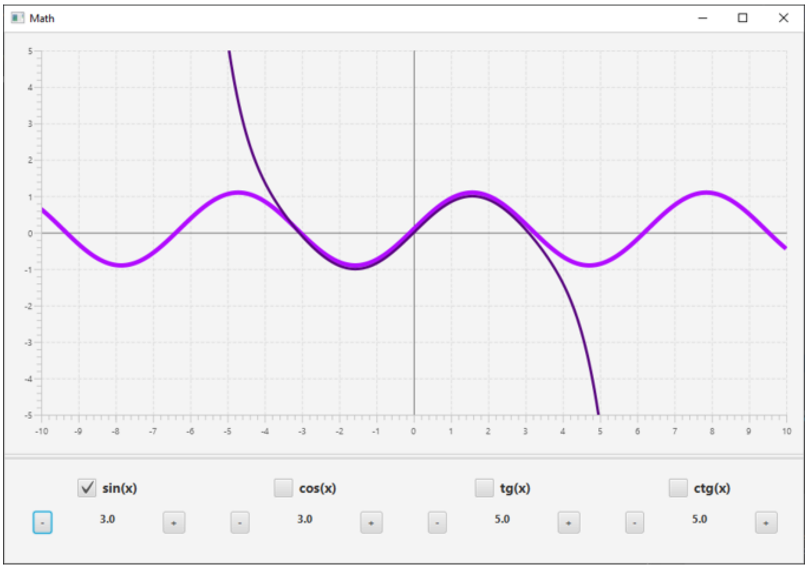
We can choose any of the given four functions: $y = \sin x$, $y = \cos x$, $y = tgx$, $y = ctgx$. For example we have chosen $y = \sin x$. Firstly, we will see the ordinary graph of the function $y = \sin x$ on the background and Taylor series for the function $y = \sin x$, colored brighter color (see Picture 4).



Picture 4 – Graph of the function $y = \sin x$ ***and its Taylor series with five terms***

We can change the number of terms using buttons **«+»** and **«–»** under the function. For the convenience each function has its own buttons (see Picture 5). Also we have the opportunity to select cosine, tangent and cotangent and change it by the same way.

When you change the number of terms in the figure, you can see the dynamics of changes in the graph of the Taylor series, which allows you to observe how the number of terms of the Taylor series affects the approximate equality (see Picture 5).



Picture 5 – Graph of the function $y = \sin x$ ***and its Taylor series with three terms***

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