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METHODS FOR SOLVING MATHEMATICAL PROBLEMS IN MAPLE

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Maple is a package for analytical computing on a computer that contains more than two thousand commands that allow solving problems of algebra, geometry, mathematical analysis, differential equations, statistics, mathematical physics.

The main objects are formulas and actions with them.

Work in Maple is in session mode - the user enters suggestions (commands, expressions, procedures) that are perceived conditionally and processed by Maple. The working field is divided into three parts:

1. the input area consists of string commands. Commands are entered after the invitation - sign.

2. output area - contains the results of processing the entered commands in the form of analytical expressions, graphic objects or error messages.

3. text comment area - contains any text information that can explain the procedures performed.

Text strings are not perceived by Maple and are not processed in any way.

To cancel all assignments made and start a new session without logging off, use the restart command.

The Maple package includes a large number of libraries, which are connected using the with command (library name). For example, the linalg package contains linear algebra operations, and functions for solving differential equations are in theDEToolslibrary [1].

Systems of analytical computation attract researchers not only for their ability to implement algorithms for constructing analytical solutions, but also for advanced graphics, from constructing the simplest two-dimensional curves to complex three-dimensional surfaces and animations of two-dimensional and three-dimensional images. At any time, the user can display the results of his calculations in the form of graphical images, which are known to be more informative than the meager numbers of digits

Universal graphical commands are collected in the plots package (they can be subdivided into two-dimensional and spatial graphics commands), and in the statplotssubpacket of the stats package there are special commands for displaying statistical data. Commands for plotting the graphs of numerical solutions of

ordinary differential equations DEplot () and partial differential equations PDEplot () can be found, respectively, in packages DEtools and PDEtools. The student package contains several illustrative commands for representing certain integrals in the form of different sums, as well as a command for mapping the tangent to the function at a given point. In order to use the listed graphical tools, it is necessary to connect the corresponding packages.

But in Maple there are two always available graphical commands that are located in the main library:

Plot () (designed for plotting functions of one variable (two-dimensional graphics);

Plot3d () (builds three-dimensional graphical maps of surfaces and spatial curves).

The multifunctional two-dimensional graphic command plot () is located in the system library Maple, and therefore is available at any time.

With the help of this command, you can plot the graph of one or more functions of one real variable, specified in an explicit or parametric form, and also display a set of points in a Cartesian or polar coordinate system.

The syntax of plot () is:

Plot (f, h, v, options); Or plot (f, h, v);

F-function, the graph of which must be displayed,

H and v represent, respectively, the range of variation of the independent variable along the horizontal axis of the graph and the range of variation of the value of the function along the vertical axis of the graph.

The range of variation of the independent variable h is given in the form x = a..b, where a and b are the smallest and largest values of the change of the variable, and x is the name of the independent variable.

The vertical range v, given by the third parameter, limits the output of the graph to a certain area of the function change. It is optional.

The options define the type of the displayed graph: the thickness, color and type of the line of the graph, the type of the coordinate axes, the placement of the inscriptions, etc. And are given in the form of the equations octopus = value. The choice of possible options in all commands of two-dimensional graphic output, with some exceptions, is the same [2].

If we want to construct a graph of functions by a bold line in the interval from -4π to 4π. For this we write:

```
>plot(sin(x)/x, x=-4*Pi..4*Pi, labels=[x,y],
labelfont=[TIMES,ITALIC,12], thickness=2);
```

And the Maple program will build the following graph:

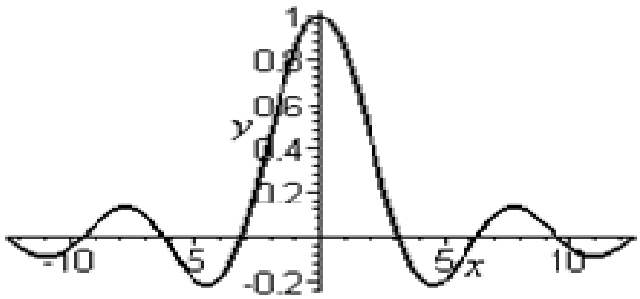

Image 1.1

In order to build a graph of functions with a blue line in the interval from 0 to, we use the following commands

```
> plot(cos(x)/x,x=0..infinity,
  -0.5..1,color=blue,
  numpoints=800);
```

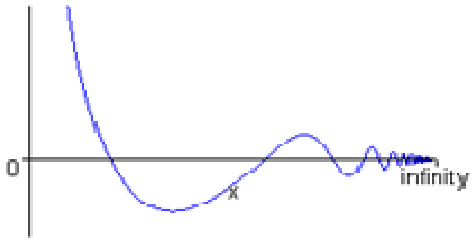

Image 1.2

The Plot function is used to construct one or more lines giving a graphical representation for the specified functions f, f1, f2, etc. In Fig. 8.1 shows the construction of the graph of the function sin (x) / x without using any options (more precisely, with a set of options by default).

Construct a graph of the discontinuous function. To do this, we type the following command.

> Plot (x / (x ^ 2-1), x = -3..3, y = -3..3, color = magenta);

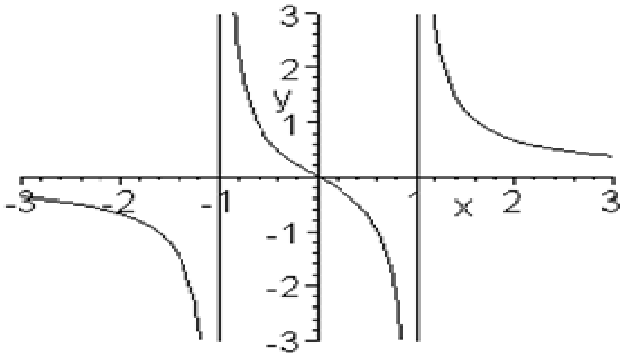

Image 1.3

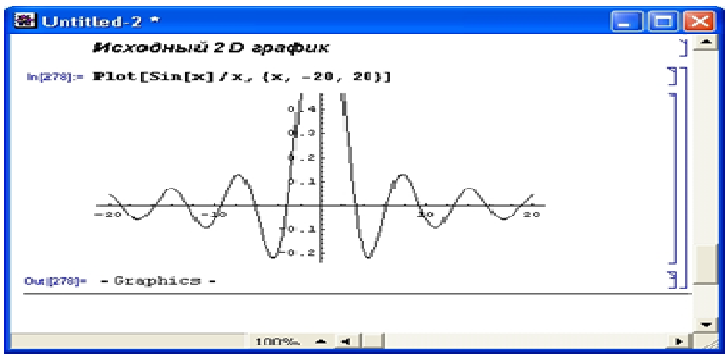

Image 1.4

Often there is a need for plotting by points. This provides the built-in graphical function ListPlot:

• ListPlot [{yl, y2, ...}] - displays the schedule of the list of values. The coordinates x take the values 1, 2, ...;

• ListPlot [{{x1, y1}, {x2, y2}, ...}] - displays a schedule of the list of values with the specified x and y coordinates [3].

In the simplest case (Figure 8.8), this function itself sets the values of the coordinate x = 0, 1, 2, 3, ... and builds points with coordinates (x, y) on the graph, choosing y successively from the list of coordinates.

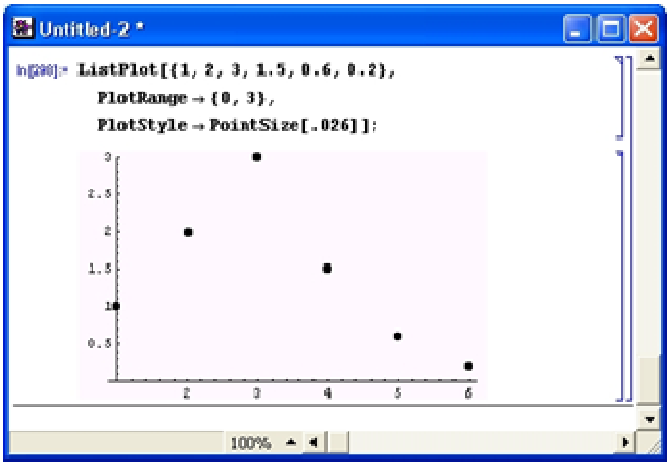

Image 1.5

References

1. Dyakonov V.P. Maple 7: Training course. St. Petersburg: Peter, 2009. - 185s.

2. Govorukhin V.N., Tsibulin V.G. Introduction to Maple. A mathematical package for everyone. - M.: The World, 2010. S.-148

3. Dyakonov V.P. Maple 9.5 / 10 in mathematics, physics and education. M .: SOLON = Press, 2009. S.-320