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IN ZOOLOGY, SOLVING A PROBLEM THAT COMES TO A DIFFERENTIAL EQUATION IN THE MAPLE PROGRAM.

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Annotation

We know that not only the problems of mathematics, but also the mathematical model of a number of processes that occur in nature can be reduced to a differential equation. Most of the quantities found in nature have their own laws. Finding these laws directly is more complicated matter. Finding the relationship between the quantity in question, its rate of change and acceleration is quite easy by nature. Simple differential equations are formed as a mathematical expression of this connection. It is important and significant to use modern computer programs to find a quick and accurate solution to such equations. Found in Maple.

Keywords

Maple system, analytical solution, ordinary differential equations, ordinary differential equation with separable variables, separable function, general solution, particular solution, initial conditions.

Is an ordinary differential equation whose variables diverge

$P(x,y)dx+Q(x,y)dy=0,(x,y)\in D$ (1)

If(1) in an ordinary differential equation defined in some two-dimensional field D, P and Qs consist only of the functions P=f(x), Q=g(y) of one variable, then the representation of Equation(1)is f(x)dx+g(y)dy=0 (2), which is called The Ordinary Differential Equation in which its variables are separated [2].

Determining the differential equation whose variables are separable in the Maple program using the separable function and finding the solution is as follows:

M A P L E P R O G R A M:

> separable_ode := diff(y(x),x)=f(x)*g(y(x));

$$separable\_ode := \frac{d}{dx}\,y(x) = f(x)\,g(y(x))$$

>with(DEtools, odeadvisor); [*odeadvisor*]

determination of the type of equation:

>odeadvisor (separable_ode); [*_separable*]

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>dsolve (separable_ode); $\int f(x)\,dx - \left(\int^{y(x)} \frac{1}{g(\_a)}\,d\_a \right) + \_C1 = 0$

In education, the solution of some issues in mastering various disciplines is not possible without differential equations. We cite the following biological problem solving program in the Maple program and get the result.

Issue 1 (in Zoology). The law of reproduction of bacteria over time. The rate of reproduction of some bacteria is proportional to the number of bacteria at a given time. Find the time dependence of the change in the number of bacteria.

We define the number of bacteria present at the same time as Y. According to the problem condition $\frac{dy}{dt} = ky$, where k is the coefficient of proportionality. This equation is a differential equation whose variables are separable. We integral it by separating its variables:

$\frac{dy}{y} = kdt$, $\int \frac{dy}{y} = k\int dt$, $\ln y = kt + \ln C$, $\ln y = \ln e^{kt} + \ln C$.

We are from the last expression: $y = Ce^{kt}$; $t = 0$, $y = y_0$ assuming, $C = y_0$ we get. So, $y = y_0 \cdot e^{kt}$ is. We find general and private solutions to this issue in the Maple program.

1) Order for an ordinary differential equation whose variables are separable:

M A P L E P R O G R A M

> separable_ode:=diff(y(t),t)=k*y(t); $separable\_ode := \frac{d}{dt}y(t) = k\,y(t)$

> with(DEtools,odeadvisor); $[odeadvisor]$

> odeadvisor(separable_ode); $[\_quadrature]$

> ics:=y(0)=y[0]; $ics := y(0) = y_0$

> dsolve({separable_ode,ics}); $y(t) = y_0\,\mathbf{e}^{(k\,t)}$

2) Directly finding the general solution to the Ordinary Differential Equation whose variables above are separable:

M A P L E P R O G R A M

> separable_ode:=diff(y(t),t)=k*y(t); $separable\_ode := \frac{d}{dt}y(t) = k\,y(t)$

> dsolve(separable_ode); $y(t) = \_C1\,\mathbf{e}^{(k\,t)}$

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3) Finding directly the private solution of the Ordinary Differential Equation, whose variables are separable above, satisfying the initial condition:

M A P L E P R O G R A M

> **separable_ode:=diff(y(t),t)=k*y(t);** $separable\_ode := \frac{d}{dt} y(t) = k\, y(t)$

> **ics:=y(0)=y[0];** $ics := y(0) = y_0$

> **dsolve({separable_ode,ics});** $y(t) = y_0\, \mathbf{e}^{(k\,t)}$

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