ABSTRACT

In this thesis the use of the Computer Algebra System (CAS) Maple for ordinary differential equations is suggested. Maple is an excellent system for the manipulation of expressions used by scientists and mathematicians, but so far it is not widely used by the public for this purpose. Many of the algorithms in Maple were implemented because their application in differential equations is known, but this functionality has not been compiled in a meaningful way for engineers. Over the past two years we have investigated what functionality students of applied mathematics and engineering faculty need and have attempted to fill in the gaps in Maple's functionality to make it more useful to students and engineers.

The use of CAS's in education process especially in mathematics education is discussed. Advantages and disadvantages of uses of CAS's in mathematics education are indicated. A basic and brief background is given about Maple. How to enter and solve an ODE and ODE system into the software Maple is given. Analytical, numerical and graphical solution methods and examples for ODE's are given in Maple. The classification, with respect to their orders, and solution methods with examples of ODE's is done. Transfer functions and frequency response curves are analyzed and Laplace transformation methods are used for these functions. Their 2-directional graphs are plotted. Some special numerical solution methods, shooting, finite-difference, Euler's, Runge-Kutta are studied. Electrical circuit problems are solved by supporting graphics.

An essential and brief background and ways about how to create Maplet applications are given. Maplet applications were designed and created for some kind of ODE's like Bernoulli DE, second-order homogeneous and non-homogeneous constant coefficient DE's and Maplet application to solve IVPs numerically for ODE's.