

Toolboxes with DERIVE

Alfonsa García, Francisco García

Universidad Politécnica de Madrid.

Departamento de Matemática Aplicada. E.U. Informática

{alfonsa.garcia, gmazario}@eui.upm.es

Gerardo Rodríguez

Universidad de Salamanca.

Departamento de Matemática Aplicada. E.P.S. de Zamora

gerardo@usal.es

Agustín de la Villa

Universidad Pontificia Comillas.

Departamento de Matemática Aplicada y Computación. ETSI (ICAI)

Universidad Politécnica de Madrid

Departamento de Matemática Aplicada. E.U.I.T. Industrial.

avilla@upco.es

ABSTRACT

The European Area of Higher Education implies a profound change in the Spanish university. We are heading towards a competency-based teaching and a learning model with greater autonomy for the student, who becomes the centre of the educational model. New technologies can play an important role in this new scenario. This paper suggests a "new" possibility in the use of new technologies: The design of a "toolbox" which could be used later on by the student when needed in other subjects of their curriculum or in their careers. This "toolbox" will contain instructions, which may either be suggested by the teacher or developed by the student as being interesting and convenient so as to explore the mathematical concepts associated with them.

There are two examples of possible "toolboxes." In the first one, instructions are related to **geometrical aspects** of the plane which are studied in high school. The instructions are concerning with drawings, equations of different geometric objects and some distance between the quoted objects.

In the second one, a toolbox is built for the subject **Calculus of a single variable** in engineering studies. In this toolbox there can be instructions about complex numbers to express them in their different expressions, calculate their power, roots, etc. It also incorporates the instructions that enable to analyze the concepts of differential calculus such as the tangent, the study of increasing and convexity, etc.

About integral calculus several tools can be included for the geometric applications. Also procedures for the trapeze method and the Simpson method are implemented.

In the study of approximate methods of solving equations we can encourage students to use algorithms NEWTON and FIXED_POINT, which DERIVE has incorporated, and design a procedure for the method of the bisection of the interval.