ABSTRACT

Replacing Remedial Algebra Courses with Finite Difference Calculus an Alternative with Benefits

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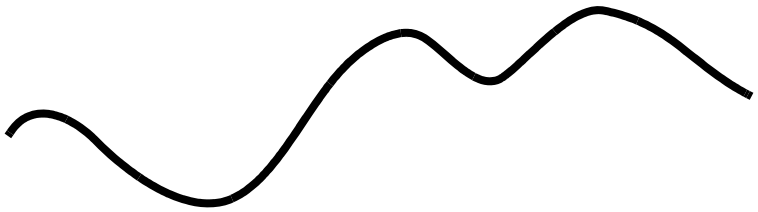
CALCULUS (Differential and Integral Calclus) is the study of the behavior of smooth functions, such as the one below.



Unfortunately, many college students are not adequately prepared to study this subject due to

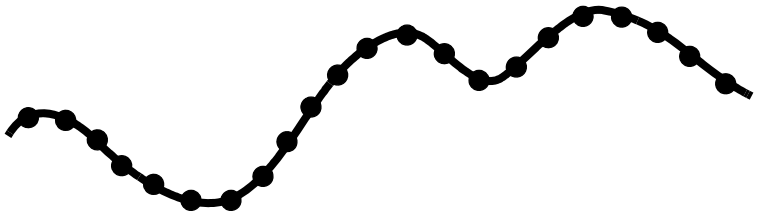
* their lack of algebraic skills

and some of the difficult concepts which are encountered all at once, such as

* functions consisting of an infinite number of points
* the concept of limits.

Universities have addressed these difficulties by introducing courses in Remedial Algebra, often with disappointing results. This should not be surprising, since such courses frequently lack interesting motivational problems, and consist of rehashed material, that students had been unable to learn earlier.

As illustrated below, examination of the previous picture shows that we would expect to be able to approximate such a smooth function fairly well by a finite sequence of some of its points.



So why not start off with a course that examines the behavior of such sequences? The tools needed for this study (first and second differences and sums) are much easier to comprehend than those requiring limits, and as we will see, yield essentially the same results obtained in CALCULUS. Furthermore, a number of interesting areas, such as

* radioactive decay
* exponential and more realistic models for population growth
* compartmental models of chemical flow in living systems

are available to motivate the theoretical development and yield useful results.

On the *apparent* down side, the algebra needed to use the less sophisticated tools of differences and sums is somewhat more complicated than that needed to study smooth functions. However, its use in studying interesting problems is evident, and the extra complexity in this simpler context should serve to sharpen students' algebraic skills. This makes it more likely that the algebraic skills needed for more advanced study will be better learned and remembered.

The end result of the suggested approach is that students will have learned and appreciated many of the important results of CALCULUS in a simple framework, while simultaneously developing the algebraic skills needed to proceed further. Later, when CALCULUS is studied, the advantage of having to learn about limits to handle smooth functions will be evident from the simpler manipulations and formulas that are developed there.

The remainder of this presentation will further explore the theory and present some illustrative examples..