Exploring the Practical Teaching of Higher Mathematics Courses for Computer Science Major in Colleges

Yi Zhou[1, *], Hongkun Zuo[1], Xiangpeng Guo[1], Jin Xu[1], Wei Xiang[1], Quanbao Ji[2]

[1]School of Finance and Mathematics, Huainan Normal University, Huainan, China

[2]School of Mathematics and Physics, Guangxi Minzu University, Nanning, China

Abstract

Higher Mathematics is one of the public courses with the largest number of students and the greatest influence in the undergraduate teaching process. For computer science students in colleges and universities, the practical teaching of this course is often neglected, and the teaching methods in the syllabus are all classroom teaching. Taking Huainan Normal University as an example, we put forward some rationalization suggestions on the practical teaching of "Advanced Mathematics" course for computer science majors in order to cultivate and improve students' ability to solve practical problems.

Keywords

Higher Mathematics; MATLAB; Practical Teaching.

1. Introduction

Higher mathematics is an extremely important professional foundation course offered by computer science majors in colleges and universities. Only by learning higher mathematics well, it is possible to complete the tasks of some computer algorithm courses and lay a solid theoretical foundation for subsequent courses. Therefore, this course has also become a mandatory part of the entrance examination for graduate students in computer science [1-2]. Along with the development of information technology, the traditional classroom lecture method has become more and more unsuitable for the enthusiastic, intelligent and agile "post-00" college students, and the traditional method overemphasizes theorem proving and calculation skills, often ignoring the analysis process of computer algorithm ideas contained in it [3]. From my interviews with computer science students in Huainan Normal University, I found that they do not consider advanced mathematics and computer science courses useful. In fact, when learning computer algorithms, the knowledge of higher mathematics is often already embedded in the algorithmic process [4].

2. Teaching Situation

The School of Computer Science of Huainan Normal University currently has 5 majors including Computer Science and Technology, Software Engineering, Data Science and Big Data, etc. In the first year, the course of Advanced Mathematics is offered, with a total of 176 hours in two semesters. Higher Mathematics (7th edition) from Tongji University Press was chosen as the teaching material. Students generally reflected well when the definitions or theorems were elaborated in classroom teaching, but the actual problem solving was not effective. This fully illustrates the serious disconnection between traditional learning and practical application. The traditional classroom lecture method makes the core position of the course not fully demonstrated and the final grade is not satisfactory. In fact, advanced mathematics courses can provide computer science students with algorithmic thinking and basis. In the core basic courses of computer science majors, such as programming and data structure, the knowledge

of advanced mathematics is ubiquitous and is a necessary pre-requisite course, which requires high mathematical foundation for students.

In addition, the status of some advanced computing software such as MATLAB (solving mathematical modeling problems) and LINGO (solving most value problems), which are used by the vast majority of engineering students, is not demonstrated in advanced mathematics classes, even though they take up a lot of computer memory.

3. Examples of Practical Teaching Applications

Based on the current teaching status of higher mathematics course in Huainan Normal University, I often discuss with the lecturers about the selection of teaching contents and the related practical teaching, and have made some useful attempts about practical teaching, which have received good teaching effect. For example, the limit command in MATLAB software can be used to find the limit of a function; the diff command can be used to find the derivative or differentiation; the int command can be used to solve the integral, etc.

3.1. Example of Solving Function Limit

We solve $\lim\limits_{x \to 0} \dfrac{(x - \sin x)e^{-x^2}}{\sqrt{1 - x^3} - 1}$ by using MATLAB programming as follows:

```
syms x;
f = ((x-sin(x))*exp(-x.^2))/(sqrt(1-x.^3)-1);
L = limit(f, x, 0)
%L = -1/3.
```

3.2. Example of Derivatives of Functions

Supposing $y = x^2 e^{2x}$, we try to solve $y^{(20)}$. we MATLAB programming as follows:

```
syms x
diff(x.^2*exp(2*x),20)
%ans =
99614720*exp(2*x) + 20971520*x*exp(2*x) + 1048576*x^2*exp(2*x).
```

3.3. Example of Integrating Functions

Solve $\int \dfrac{dx}{(2 + \sin^2 x)\cos x}$ by using MATLAB programming as follows:

```
x=sym('x')
f=1/((2+sin(x)^2)*cos(x))
int(f)
ans =
atanh(sin(x))/3 + (2^(1/2)*atan((2^(1/2)*sin(x))/2))/6.
```

3.4. Example of Sovling the Extreme Value of a Function

Solve and plot function $y = x^3 + 2x^2 - 5x + 1$ by using MATLAB programming as follows:

```
y='x^3+2*x^2-5*x+1'

dy=diff(f)

x=solve(dy)
```

x=double(x)

y1=x.^3+2*x.^2-5*x+1

fplot(y,[-4,2])

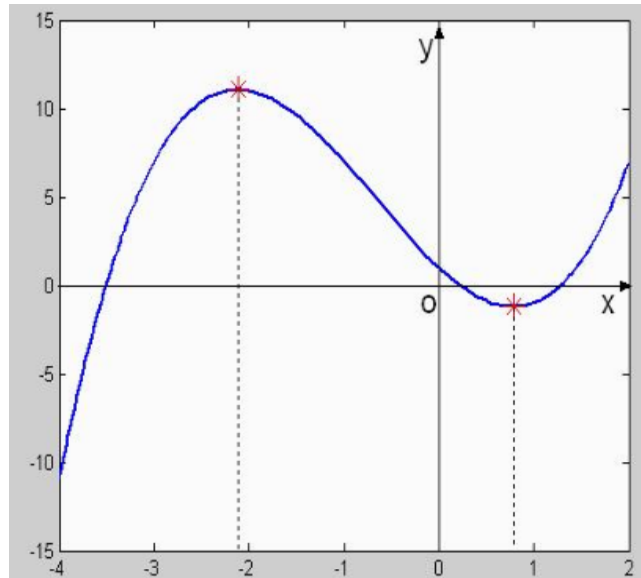dy = 3*x^2+4*x-5

x=[0.7863 -2.1196]; y1=[-1.2088 11.0607]

Fig 1. Function extremum coordinate graph

4. Conclusion

This paper takes Huainan Normal University of Computer Science as an example, discusses the problems of current course teaching for computer science majors, and gives some suggestions about the practical teaching of the course, through solving function limits, derivatives, integrals and extreme value problems, and using MATLAB software for programming, so that students can better master the The course has received good teaching effect by solving limit, derivative, integral, and polar value problems and using MATLAB software for programming, so that students can better master the basic knowledge received in class. In the future, how to better stimulate students' interest in learning will be our future concern.

Acknowledgments

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