

Track: Poster Session

Abstract for 12939

What is the function $y^{(n)} = y$? Authors: Shin Watanabe

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Keywords: Undergraduate Level, Taylor Series

Topics: Mathematics Teaching, Learning and Assessment using Technology, Applications using TI technologies

The goal of Japanese mathematical education is the calculus. In this learning we do not use IT machine which is the graphic calculator or the computer. In this paper, we use the graphic calculator for seeing the graph of the function $y^{(n)} = y$? We want to find out the functions that satisfy $y^{(n)} = y$?

Abstract for 12992

Using Cabri3D Program for Developing Student's Problem Solving Ability

Authors: NamHee Kim

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Keywords:

The purpose of this research is to investigate desirable methods of using Cabri3D program on mathematical problem solving education. In this study, we showed concrete learning materials that will be effective for teacher to guide their students by using Cabri3D.

A theoretical basis of this study are Polya's problem solving theory, the "technology principle" by NCTM(2000) and teaching-learning methods by the Korean mathematics curriculum. Polya's prescription for solving problems consists of four steps. First step is understanding the problem(recognizing what is asked for). Second step is devising a plan(responding to what is asked for). Third step is carrying out the plan(developing the result of the response). Fourth step is looking back(a verification or expansion of the result). Especially, Korean mathematics curriculum(2007) suggests the utilization of technology in education for the development of problem solving ability.

Under this background, we investigated educational examples using Cabri3D in each step that Polya(1971) suggests in mathematical problem solving process. Moreover, we tried to connect these examples with meaningful questions using heuristics.

[Examples on using Cabri3D on the problem solving education]

(1) Step 1: Understanding the problem

- understanding the meaning of 3-dimensional problem
- visual understanding of mathematical theorems
- intuitive confidence about mathematical facts

(2) Step 2: Devising a plan

- expansion of a thinking by analogy

(3) Step 3: Carrying out the plan

- actualization of idea

(4) Step 4: Looking back

- applying present results(methods) to another problem
- suggesting a new problem
- checking present results by another method

By using Cabri3D program, we can explore and describe space geometry easily. Students can use Cabri3D as a good instrument in mathematical problem solving process. Also they can visualize mathematical properties related to what they are currently studying on space geometry.

In our poster presentation, we will show educational examples that are developed in our study using Cabri3D. And we will explain these examples with problem solving process by heuristics.

Our study helps mathematics teachers to use computer program effectively to develop student's problem solving ability. Concrete learning materials that are presented in this study can be directly applied in mathematics classes at secondary schools.

References

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Abstract for 13033

Hartree _Fock Numerical calculations for Helium atom

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Keywords:

Topics: Mathematics Research with Technology

The self-consistent field derived quantum mechanically by the Hartree Fock approximation is used to calculate the ground state and excited states of the helium atom (He). The electric potential, used in this approach, is calculated by using Poisson's equation. The ground state value of He is found to be -2.89459 a.u which is below the commonly accepted limit[1]. The excited states are found to be -4.149 eV for 1s2s, -3.431 eV for 1s2p, -1.725 eV for 1s3s and -1.521 eV for 1s3p. We should note that using Poisson's equation greatly simplified the mathematical calculation.

R. Celeste, H.F.M. da Costa, A.B.F da Silva and M. Trsic, J. Chem.. Phys. 23 (1991) 1831

Abstract for 13379

Detecting a suitable reduction technique for medical, business and engineering data

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Keywords:

Topics: Applications using TI technologies

In real world, organizations often have large amount of data that are stored in databases. The large size of data makes data analysis difficult as data are more complex in terms of number of attributes and number of objects. The use of a sufficient number of attributes and objects are one way to overcome the problem. There are many techniques that can be used for reducing data in data mining. In this research project, two reduction techniques namely PCA, and GA, will be tested on datasets of two different domains namely medical and engineering. The research will examine which reduction technique is most suitable for medical and engineering datasets. In addition, the research will identify the ranking of the three techniques.

Abstract for 13614

Approximate Four-arcs Ellipse Construction with Smallest Error

Authors: Zhenbing Zeng, Zhibin Li, Guangxi Chen

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Topics: Mathematics Research with Technology

The Four-arcs Ellipse Construction was a classical method to draw an ellipse with four circular arcs. In this talk we discuss the errors of distance of equidistant curve in the Four-arcs Ellipse Construction and suggest a new approximate four-arcs ellipse construction method with minimal error based on computation.

Abstract for 14169

Helping Each Other To Learn Makes Math Easy

Authors: SOMRUAY APICHATIBUTARAPONG

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Keywords:

Topics: Mathematics Teaching, Learning and Assessment using Technology

Alternative teaching strategies, CAI and Cooperative Learning were compared to the Traditional Method in teaching Critical Thinking among 120 freshmen at Suan Sunandha Rajabhat University. Even though, achievement gains did not show statistically significant differences, it was found that attitude toward learning Mathematics reported in diary among those in Cooperative Learning group was more positive than those in other groups. Words like easy, more manageable, useful, enjoyable, creative, and motivating were often found in the diaries. Their expression in the diaries was supported by their responses in attitude semantic rating scale. They were indicated feeling of easy, useful, and enjoyable more than hard, boring, and difficulties. A couple students said that they had had this kind of learning before this, they might take majoring in Mathematics. It was their success in learning that made them more confident in learning. Besides, learning in a group did not make them lonely. They even expressed that Mathematics was not scare as they felt earlier. Learning Mathematics is more fun in helping each other to learn.

Abstract for 14171

Integrated Set Theory into Geometry Using the Geometer's Sketchpad (GSP)

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Keywords:

Topics: Mathematics Research with Technology

Classical Euclidean geometry had served as a foundation for much of mathematics before the development of set theory. From an advanced standpoint, the basics of classical Euclidean geometry can fit into the framework of set theory. The purpose of this action research study is to indicate how set theory can be integrated into classical Euclidean geometry by using the Geometer's Sketchpad (GSP). The GSP clearly illustrates a line is a set of points going to stretch out infinitely far in both directions. A line segment and a ray can be defined as a subset of a line. A geometrical plane and 3-dimensional space are sets of points. There are many geometric figures can be defined in term of the operations on set; for example, we define that a triangle ABC is the \cup of three segments AB, BC and CA. Based on the action research, "It was possible to construct a system within set theory which satisfies the conditions for a Euclidean plane". Finally, using the dynamic GSP explains some important concepts and theories most notably the viewpoints of intuitionism and constructivism.

Abstract for 14174

Exploring Transformation Matrices by The Geometer's Sketchpad (GSP)

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Keywords:

Topics: Mathematics Research with Technology

The purpose of this study is to develop mathematic tool of exploring Transformation Matrices by the Geometer's Sketchpad (GSP) and to ascertain the attitude of the undergraduate students using this tool. The sample, the fourth year students in education curriculum (5-year teacher program) majoring in Mathematics during academic year 2007, practiced skills in creating mathematic tool of exploring matrices of transformations by the Geometer's Sketchpad that the researcher developed. The equipment used in practicing skills is the developing tool manual of exploring matrices of transformations by the Geometer's Sketchpad and the opinion questionnaire about using the mathematic tool. The analysis of the data is completed by using means and standard deviations from the result of the opinion questionnaire.

The outcome in developing tool of exploring matrices of transformations by the Geometer's Sketchpad is divided into 4 parts; 3 folder documents of matrices and operations, 4 folder documents of transformations, 5 folder documents of matrices transformation in a plane and 8 folder documents of matrices transformation in 3-dimension. The result from the opinion analysis in using the developing tool manual shows that the manual is properly in good level. This indicates that the manual that the researcher developed is efficacious to be used in developing tool of exploring matrices of transformations by the Geometer's Sketchpad or to be a guideline in order to develop mathematic tool of exploring other Mathematics substance in the future.

Abstract for 14175

Making Mathematics Fun and Challenging with Geometer's Sketchpad (GSP):

From Mathematics Classroom to Commercial Product

Authors: Krongthong Khairiree

Affiliations: Suan Sunandha Rajabhat University

Keywords:

Topics: Mathematics Research with Technology

The purpose of this research study is to explore mathematics project-based learning approach and the use of technology in the context of school mathematics in Thailand. Data of the study were collected from 6 sample upper secondary schools and the students were 16 year-old.

Research findings show that through mathematics project-based learning approach and the use of GSP, students were able to make mathematics learning fun and challenging. Based on the students' interviews they revealed that with GSP they were able to visualize and create graphical representations, which will enable them to develop their mathematical thinking skills, concepts and understanding. The students had fun in creating variety of graphs of functions which they can not do by drawing on graph paper. In addition, there are evidences to show the students' abilities in connecting mathematics to real life outside the classroom and commercial products, such as weaving, patterning of broomstick, and ceramics design.

Abstract for 15001

The Role of Spreadsheet in Model Refinement in Mathematical Modeling activity

Authors: Hong Chan Son (KICE) and Hee-chan Lew (KNUE)

In mathematical modeling activity, modeling process is usually an iterative process. When model can not be solved, the model needs to be simplified by treating some variables as constants, or by ignoring some

variables. On the other hand, when the results from the model are not precise enough, the model needs to be refined by considering additional conditions.

In this talk we investigate the role of spreadsheet model in model refinement and modeling process. In detail, we observed that by using spreadsheet model students can solve model which can not be solved in paper-pencil environment. And so they need not go back to model simplification process but continue model refinement. By transforming mathematical model to spreadsheet model, the students can predict or explain the real word situations directly without passing the mathematical conclusions step in modeling process.
