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IV International Scientific and Practical Internet Conference
«*Mathematics and Informatics in Science and*
***Education: Challenges of Modernity*»**

(dedicated to the 90th anniversary of the Department of
Mathematics and Informatics)

May 25-26, 2023, Vinnytsia, Ukraine



Book of Abstracts

Vinnytsia – 2023

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IV International Scientific and Practical Internet Conference "Mathematics and Informatics in Science and Education: Challenges of Modernity", dedicated to the 90th anniversary of the Department of Mathematics and Informatics (Vinnytsia, May 25-26, 2023): book of abstracts [Electronic network scientific publication]. Vinnytsia, 2023. 254 p. 6,3 Mb.

The book contains abstracts of IV International Scientific and Practical Internet Conference "Mathematics and Informatics in Science and Education: Challenges of Modernity" (dedicated to the 90th anniversary of the Department of Mathematics and Informatics), which took place on May 25-26, 2023 on the basis of the Faculty of Mathematics, Physics and Computer Science of Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University.

The abstracts in the book are grouped by sections, in accordance with the main directions of the conference: Section 1. Modern problems of mathematics; Section 2. Modern problems of computer science; Section 3. Mathematical and computer modeling; Section 4. Creation of educational environment in mathematics and computer science in higher education; Section 5. Monitoring of the quality of education: tools and technologies; Section 6. Modern computer technologies in teaching mathematics and computer science; Section 7. Methods of teaching mathematics and computer science in secondary education.

The publication is addressed to researchers, lecturers, teachers, graduate students, undergraduates, as well as everyone who is interested in modern problems of science and education.

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Збірник тез

Вінниця – 2023

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Збірник містить тези IV Міжнародної науково-практичної Інтернет-конференції "Математика та інформатика в науці й освіті: виклики сучасності" (присвячена 90-річчю кафедри математики та інформатики), яка відбулася 25-26 травня 2023 року на базі факультету математики, фізики і комп'ютерних наук Вінницького державного педагогічного університету імені Михайла Коцюбинського.

Тези у збірнику згруповано за секціями, відповідно до тематичних напрямів конференції: Секція 1. Сучасні проблеми математики; Секція 2. Сучасні проблеми інформатики; Секція 3. Математичне та комп'ютерне моделювання; Секція 4. Формування освітнього середовища з математики та інформатики у закладах вищої освіти; Секція 5. Моніторинг якості освіти: засоби та технології; Секція 6. Сучасні комп'ютерні технології у викладанні математики та інформатики; Секція 7. Методика навчання математики та інформатики в закладах середньої освіти.

Видання адресоване науковцям, викладачам, учителям, аспірантам, магістрантам, а також усім, хто цікавиться сучасними проблемами науки та освіти.

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APPLICATION OF THE COMPUTER MATHEMATICS SYSTEM MAPLE FOR CALCULATING FIGURE'S AREA BOUNDED A CIRCLE AND A CARDIOID

Abstract. The problems of introduction and adaptation of the Maple computer mathematics system in the educational process in teaching the course of higher mathematics are considered. In the paper presents an adaptation the use of the SCM Maple graphics package to build 2D figures in the polar coordinate system in the problems of calculating the figure's area.

Key words and phrases: computer mathematics system, Maple, information and educational environment, figure's area, 2D graph, polar coordinate system, cardioid.

One of the main places among a significant number of systems of computer mathematics is occupied by SCM Maple, which allows the user to use an intelligent environment for mathematical research [1–8]. A significant share of SCM Maple also occupies in various scientific studies.

To perform graphical constructions in SCM Maple, specialized packages of graphic commands «plots» and «plottools» are used.

```
restart: with(plots): with(plottools):
```

Solving the problem of calculating the figure's area that is bounded by a circle and located outside the cardioid must be performed in the polar coordinate system, since the functions of the circle and cardioid have a much simpler analytical expression compared to the Cartesian system.

First, we set the equation of the functions that limit the figure, the area of which needs to be calculated (Fig. 1).

```
rho[1]:=phi->2:  
rho[2]:=phi->2*(1+cos(phi)):
```

In the polar coordinate system, the intersection points will be determined by the polar angle θ . To find the specified angle in Maple, we use the function of analytical solution of systems of equations *solve(equations, variables)*.

```
print(rho[1](phi)=rho[2]('Theta'));  
Theta:=solve(rho[1](phi)=rho[2](phi),phi);
```

The *plot(f, x=x0..x1)* function was used to perform graphic constructions on the plane with different parameters of the line thickness and its color. The arc construction function *arc(c, r, a..b, options)* was used to construct the angle designation, and *line(a, b, options)* was used to construct the lines. We also used the *textplot(L, options)* command for constructing text labels on graphs.

```
pol1:=plot([rho[1](phi),phi,phi=0..2*Pi],coords=polar,thickness=2,color=RED):  
pol2:=plot([rho[2](phi),phi,phi=0..2*Pi],coords=polar,thickness=2,color=BLUE):  
radius1:=line([0,0],[rho[1](phi)*cos(Theta),rho[1](phi)*sin(Theta)],linestyle=DASH):  
radius2:=line([0,0],[rho[1](phi)*cos(-Theta),rho[1](phi)*sin(-Theta)],linestyle=DASH):  
a:=arc([0,0],.4,0..Theta,color=BLACK):  
t:=textplot([0.5,.4,'Q'],font=[SYMBOL,16]):
```

Each graph was presented as a separate construction, and then we implemented their joint display on one canvas using function *display(L, inseq, options)*.

```
plots[display]([pol1,pol2,radius1,radius2,a,t,seq(poly[i],i=1..total)],scaling=constrained);
```

Since the constructed figure is symmetrical, we will calculate the area of half of the figure and multiply by 2 (Fig. 2).

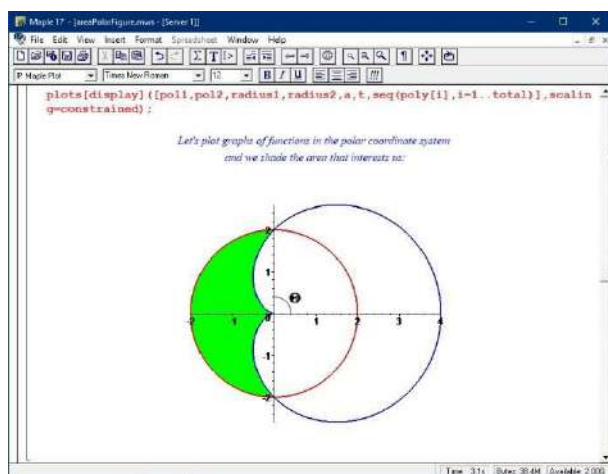


Fig. 1 – Figure bounded by given graphs of functions

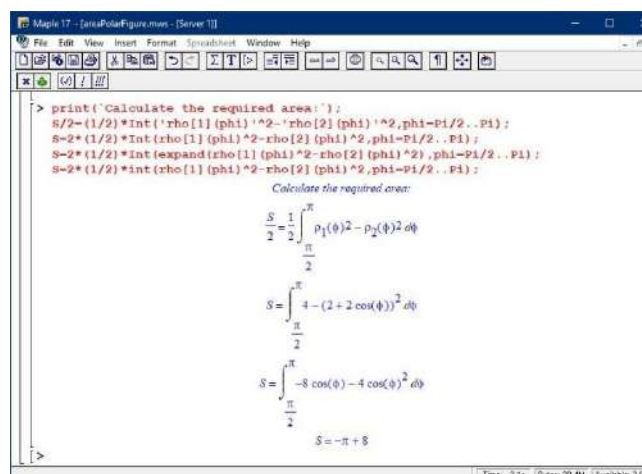


Fig. 2 – Calculation of the figure's area using the definite integral

Part of the mathematical apparatus and the developed code fragments in the SCM Maple, enable students to automatically obtain intersection points of function's graphs constructed in the polar coordinate system, build the corresponding figures and calculate their area, which improves the quality of the knowledge obtained under time to solve typical problems of higher mathematics.

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MODEL FOR ASSESSING THE USEFULNESS OF AN INSURANCE CONTRACT

Abstract. We consider the assessment of the utility of the insurance contract by means of economic and mathematical modeling, namely the insurance model, which describes the model of the insured and the model of the insurer. The algorithm for evaluating the usefulness of an insurance contract is shown.

Key words: insurance model, objective function, policyholder's objective function, insurer's objective function, policyholder's risk.

Економіко-математичне моделювання – ефективний інструмент вивчення економічних об’єктів та спосіб прийняття рішення по управлінню ними в реальних життєвих ситуаціях. Математичний інструментарій, який