

<https://doi.org/10.5281/zenodo.17289475>

Mirzakarimov Ergashboy Mirzaboevich

Dotsent Farg'ona davlat texnika universiteti, Farg'ona, Uzbekiston

Tel: 90 634-65-46, e-mail: ergashboy.mir@mail.ru

Аннотация. *Ushbu maqolada keng qo'llaniladigan universal kompyuter matematikasi tizimi Maple yordamida birinchi kurs talabalari uchun aniq integralni hisoblash va masalaga doir geometrik shakillarni qurish amallarini bajarishni misollari asosida qisqacha ko'rib chiqilgan.*

Kalit so'zlarlar: *Integrallash, yuza, hajm, inersiya momenti, massa, hosila, hisoblash.*

РЕШЕНИЕ ЗАДАЧ НА ПРИМЕНЕНИЕ ОПРЕДЕЛЁННЫХ ИНТЕГРАЛОВ В СИСТЕМЕ MAPLE

Мирзакаримов Эргашбой Мирзабоевич

Доцент Ферганский государственный технический университет,

Фергана, Узбекистан

Tel: 90 634-65-46, e-mail: ergashboy.mir@mail.ru

Аннотация. *В данной статье на примерах кратко рассматривается применение широко используемой универсальной системы компьютерной математики Maple для студентов первого курса для выполнения операций по вычислению определённых интегралов и построению геометрических фигур, связанных с рассматриваемой задачей.*

Ключавые слова: *Интегрирование, площадь, объём, момент инерции, масса, производный, вычисление.*

SOLVING PROBLEMS OF APPLICATION OF CERTAIN INTEGRALS IN THE MAPLE SYSTEM

Mirzakarimov Ergashboy Mirzaboevich

Associate Professor Fergana State Technical University,

Fergana, Uzbekistan

Tel: 90 634-65-46, e-mail: ergashboy.mir@mail.ru

Abstract: *This article briefly examines, using examples, the application of the widely used universal computer mathematics system Maple for first-year students to perform*

operations on calculating definite integrals and constructing geometric figures related to the problem at hand.

Key words: *Integration, area, volume, moment of inertia, mass, derivative, calculation.*

KIRISH

Maple - matematik ifodalarni ramziy o'zgartirishni amalga oshirish, yuqori aniqlikdagi sonli hisob-kitoblarni amalga oshirish, ma'lumotlarni qayta ishlash va natijalarni vizualizatsiya qilish uchun etakchi tizimlardan biri. Bugungi kunda har yili yangilanib turadigan dastur murakkab ilmiy-texnik loyihalarni amalga oshirish va modellashtirish uchun mo'ljallangan kuchli hisoblash tizimiga aylandi[9,10].

Maple dasturidan oliy matematika fani bo'yicha ma'ruza va amaliy mashg'ulotlarini sifatli tashkil qilishda va undan talabalarning fikrlash qobiliyati va tasavvur diorasi kengaytirishda samarali foydalanish mumkin. Bu borada tanlangan mavzu yordamida oliy matematika masalalarining aniq yechimlarini topishda, masala mohiyatini va masalaga bog'liq geometrik shakllarni 3D formatida tasavvur qilishda Maple dasturidan foydalanishning imkonoyatlarini ko'rsatamiz[4,5,6].

ASOSIY QISM. Aniq integral geometriyada figuralarning yuzalarini, egri chiziqlar yo'ylarining uzunliklarini, jismlarning hajmlarini va x o'zgaruvchining o'zgarish oralig'i bilan bog'liq bo'lgan boshqa miqdorlarni topish masalalarini yechishda qo'llaniladi.

Berilgan $y = 1 + x - x^2$, $y = 1 - x$ chiziqlar bilan chegaralangan yassi yuzani, uning og'irlik markazini, yassi yuzani koordinata o'qlari atrofida aylanishdan hosil bo'lgan aylanma jismning hajmi va sirtini hisoblash masalasini ko'ramiz.

Masalaning yechimini to'g'ridan-to'g'ri Maple dasturi asosida yechamiz.

Maple dasturi

> restart;

Funksiyalarni aniqlash:

> f2:=x->1+x-x^2: f1:=x->1-x:

Chiziqlarning kesishish nuqtalarini aniqlash:

> solve({y=f1(x),y=f2(x)},{x,y});

{x = 0, y = 1}, {x = 2, y = -1}

> a:=0:b:=2:

Yassi yuza shaklini qurish:

> plot({f2(x),f1(x)}, x=-1..3, y=-3..3,color=[red,blue], style=line, thickness=2, title='YUZA'); (1-rasm)

Yassi yuzani hisoblash:

> S:=int(f2(x)-f1(x),x=a..b)=abs(int(f2(x)-f1(x), x=a..b));

$$S := \int_0^2 (2x - x^2) dx = \frac{4}{3}$$

> **S:=abs(int(f2(x)-f1(x), x=a..b));**

$$S := \frac{4}{3}$$

Yassi yuzaning Ox va Oy o'qlariga nisbatan statik momentlarini hisoblash:

> **Mx:=Int((f2(x)^2-f1(x)^2), x=a..b)/2=int(f2(x)^2-f1(x)^2, x=a..b)/2;**

$$Mx := \frac{1}{2} \int_0^2 ((1+x-x^2)^2 - (1-x)^2) dx = \frac{8}{15}$$

> **My:=Int(x*(f2(x)-f1(x)), x=a..b)=int(x*(f2(x)-f1(x)), x=a..b);**

$$My := \int_0^2 x (2x - x^2) dx = \frac{4}{3}$$

Yassi yuzaning og'irlik markazini hisoblash:

xc:=My/S;

$$xc := \frac{3}{4} \int_0^2 x (2x - x^2) dx = 1$$

> **yc:=Mx/S;**

$$yc := \frac{3}{8} \int_0^2 ((1+x-x^2)^2 - (1-x)^2) dx = \frac{2}{5}$$

Yassi yuzaning og'irlik markazini aniqlash(2-rasm):

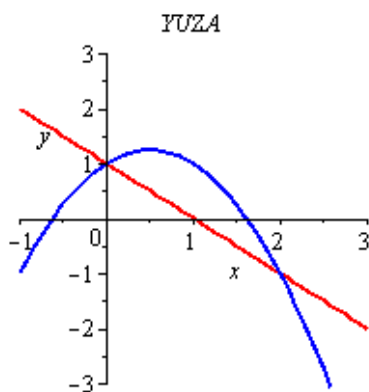
> **with(plots):**

> **p1:=plot(f1(x),x=a..b,color=red,style=line, thickness=2);** *p1 := PLOT(...)*

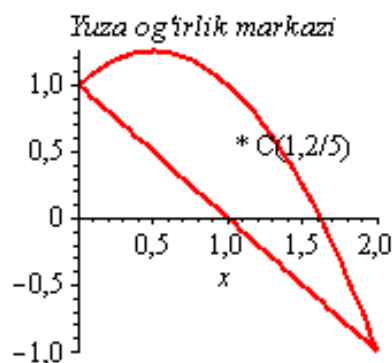
> **p2:=plot(f2(x),x=a..b,color=red,style=line, thickness=2);** *p2 := PLOT(...)*

> **Cnuq1:=textplot([1,2/5,"* C(1,2/5)"],align={above, right});** *Cnuq1 := PLOT(...)*

> **display([p1,p2,Cnuq1],title='Yuza og'irlik markazi');**



1-rasm.



2-rasm.

Yassi yuzaning Ox o'qi atrofida-gorizontaal aylanishdan hosil bo'lgan jismni shaklini qurish va hajmini hisoblash(3-rasm):

> **with(Student[Calculus1]):**

> **VolumeOfRevolution(f2(x),f1(x),x=a..b, output=plot, thickness=2);** (3-rasm)

> **Vx:=VolumeOfRevolution(f2(x),f1(x),x=a..b,output= integral);**

$$V_x := \int_0^2 \pi |4x - 2x^2 - 2x^3 + x^4| dx$$

> **Vx:=VolumeOfRevolution(f2(x),f1(x),x=a..b);**

$$V_x := \frac{44}{15} \pi - \frac{16}{15} \pi \sqrt{2}$$

> **Vx:=evalf(%,5);**

$$V_x := 4.4761$$

Yassi yuzani Oy o'qi atrofida aylanishdan hosil bo'lgan jism shaklini qurish va hajmini hisoblash(4-rasm):

> **VolumeOfRevolution(f2(x),f1(x),x=a..b,output=plot, thickness=2, axis=vertical);** (4-rasm)

> **Vy:=VolumeOfRevolution(f2(x),f1(x),x=a..b, output=integral,axis=vertical);**

$$V_y := \int_0^2 (-2 \pi x^2 (-2 + x)) dx$$

> **Vy:=VolumeOfRevolution(f2(x),f1(x),x=a..b,axis= vertical);**

$$V_y := \frac{8}{3} \pi$$

Egri chiziqning to'g'ri chiziq bilan kesilgan bo'lagining uzunligini hisoblash:

> **dx:=diff(f2(x),x);** $dx := 1 - 2x$

> **L:=Int(sqrt(1+(dx)^2),x=a..b);**

$$L := \int_0^2 \sqrt{2 - 4x + 4x^2} dx$$

> **L:=int(sqrt(1+(dx)^2),x=a..b);**

$$L := \frac{1}{4} \sqrt{2} - \frac{1}{4} \ln(\sqrt{2} - 1) + \frac{3}{4} \sqrt{2} \sqrt{5} - \frac{1}{4} \ln(-3 + \sqrt{2} \sqrt{5})$$

> **L:=evalf(%,5);**

$$L := 3.4002$$

Aylanma jismning sirt yuzasini hisoblash:

> **S1:=SurfaceOfRevolution(f1(x),x=0..2,output=integral);**

S1:=SurfaceOfRevolution(f1(x), x=0..2):

$$S1 := \int_0^2 2 \pi |x - 1| \sqrt{2} dx$$

S1:=evalf(%,5); $S1 := 8.8858$

> **S2:=SurfaceOfRevolution(f2(x),x=0..2,output=integral);**

S2:=SurfaceOfRevolution(f2(x), x=0..2):

$$S2 := \int_0^2 2\pi |-1-x+x^2| \sqrt{2-4x+4x^2} \, dx$$

> S2:=evalf(%5); S2 := 15.546

> S:=S1+S2;S:=evalf(%5); S := 24.4318

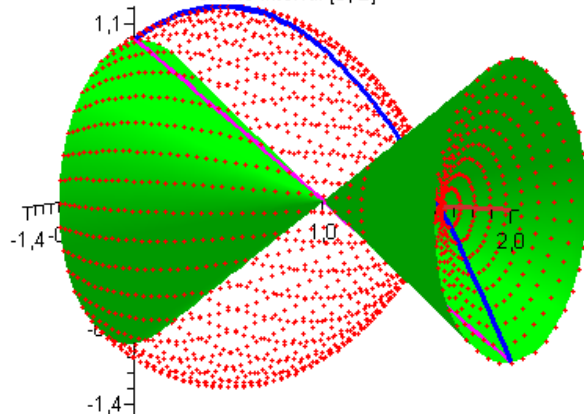
The Volume of Revolution Around the Horizontal Axis Between

$$f(x) = 1+x-x^2$$

and

$$g(x) = 1-x$$

on the Interval $[0, 2]$



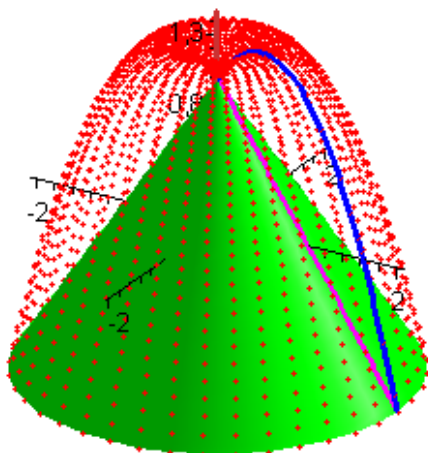
The Volume of Revolution Around the Vertical Axis Between

$$f(x) = 1+x-x^2$$

and

$$g(x) = 1-x$$

on the Interval $[0, 2]$



3-rasm.

4-rasm.

Olingan natijalarni tahlil qilish. Malpe tizimi Oliy matematikaning analitik geometriya va matematik analiz sohalarida masalalarni tez, aniq va sifatli yechish uchun ishlatilishi mumkin, shuningdek, 2D va 3D formatlarida animatsion grafikalar va raqamlarni o'z ichiga olgan muhandislik masalalarini hal qilish imkonini beradi [1,2,3].

Xullosa. Bugungi kunda kompyuter yordamida ko'plab masalalarni, matematik modulini tuzishda va bu masalalarni katta tezlikda hal qilishga xizmat qiluvchi Maple matematik paketi mavjud bo'lib, murakkab geometri shaki va grafiklarni 2D va 3D

farmatlarida tez, aniq va sifatli tasvirlashda Maple tizimi dasturlaridan foydalanish qulay va samarali ekanligi ko'ramiz[7,8].

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