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OBRAZ VA UNING BADIY ADABIYOTDA NAMOYON BO'LISHI Fozilov Muhammadjon To'lqin o'g'li	1118
SHARQ VA G'ARB ADABIYOTIDA AN'ANAVIY OBRAZLAR TABIATI Fozilov Muhammadjon To'lqin o'g'li	1128
O'ZBEK ADABIYOTINING SO'NMAS YULDUZI Dilnavoz Bo'riyeva	1135
INSONDA ISHONCH-E'TIQODNI SHAKLLANTIRISHDA AXLOQNING O'RNI Sardor Xusanov	1137
MAKTABGACHA TA'LIM TASHKILOTLARIDA YOZGI SOG'LOMLASHTIRISH ISHLARINI TASHKIL QILISH AFZALLIKLARI Boymatova Sohobxon Mahmudjanovna	1142
O'RTA OSIYODA DASTLABKI TASAVVUF TARIQATLARINING YOYILISHI Tuychiyev Zafar Nordonqulovich	1147
MULTIMEDIA TEXNOLOGIYALARIDAN FOYDALANISH TA'LIMNING ISTIQBOLI SIFATIDA Maqsudova Shoxira Mugubaliyeva	1153
DIFFERENSIAL TENGLAMALAR FANINI O'QITISHDA MAPLE DASTURINING O'RNI Usmonov Baxtiyor Zoxirovich, Saidmamadova Marjona Nurmuhammad qizi	1157
CLASSIFICATION OF COMPOUND NOUNS IN ENGLISH AND UZBEK LANGUAGES Ziyodullayeva Marjona Habibullo qizi	1165
MARKETING FAOLIYATI SAMARADORLIGINI BAHOLASHNING NAZARIY ASOSLARI VA AMALIY IFODASI Boyjigitov Sanjarbek Komiljon o'g'li	1170
AJOYIB JADVAL Sherimbetova Nargiz	1181
BO'LAJAK TARBIYACHILARNING KOMMUNIKATIV KOMPETENSIYASINI RIVOJLANTIRISHNING MAZMUNI Mavlonova Sojida	1184
SALOMATLIK VA SOG'LOM TURMUSH TARZI Maxkamova Xakimaxon Abdusamad qizi	1191
"DREAMS OF THE WINCH" BY ALEXANDER FAYNBERG THE MAIN IDEA AND IMPORTANCE OF THE WORK Moyliyeva Charos Donyor qizi	1195
BOLALAR OVQAT HAZM QILISH TIZIMIDAGI FUNKSIONAL O'ZGARISHLAR ANIQLANISHI Tog'ayeva Guljahon	1198

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ANNOTATSIYA

Ushbu maqolada zamonaviy ta’limda matematik paketlarning o‘quv jarayonidagi o‘rni va roli bir qancha sezilarli va samaradorli. Murakkab matematik masalalarni yechishni osonlashtiradi. Matematik paketlardan o‘quv jarayonida foydalanish matematik va texnik ta’limning fundamentalligini oshirishni taminlaydi. Talabalarning nazariy bilimlarini amaliyotga qo‘llash mahoratlarini oshiradi.

Kalit so‘zlar: differensial tenglama, Koshi masalasi, maple dasturi, grafik, funksiya

АННОТАЦИЯ

В данной статье роль и место пакетов по математике в учебном процессе в современном образовании достаточно значимы и эффективны. Облегчает решение сложных математических задач. Использование математических пакетов в процессе обучения улучшает основы математики и технического образования. Улучшает способность учащихся применять теоретические знания на практике.

Ключевые слова: дифференциальное уравнение, задача Коши, программа maple, граф, функция

ABSTRACT

In this article, the role and place of mathematics packages in the learning process in modern education is quite significant and effective. Makes it easier to solve complex mathematical problems. The use of math packages in the learning process enhances the fundamentals of mathematics and technical education. Improves students' ability to apply theoretical knowledge in practice.

Keywords: differential equation, Cauchy problem, maple program, graph, function

Matematika va har xil fan sohalari (masalan, fizika, kimyo, biologiya, tibbiyot, texnika va hokazo)ning turli masalalarini o'rganish ko'p hollarda oddiy differensial tenglamalar yoki tenglamalar sistemasini yechishga olib kelinadi. Aniq amaliy masala esa ixtiyoriy tartibli differensial tenglama yoki har xil tartibli differensial tenglamalar sistemasini yechishni talab etadi. Differensial tenglamlarni yechishda zamonaviy axborot-kommunikatsiya texnologiyalaridan foydalanish dars samaradorligini oshirishga xizmat qiladi. Zamonaviy axborot-kommunikatsiya texnologiyalarini qo'llagan holda ta'limni boshqarishni avtomatlashtirish va har tomonlama tahlil qilib borish tizimini yaratish, elektron resurslar va masofaviy ta'limni yanada rivojlantirish, ta'lim oluvchilar o'rtasida IT-sohasidagi kasblarni ommalashtirish. Ilm-fanni iqtisodiyotning asosiy harakatlantiruvchi kuchiga aylantirish, ilmiy tadqiqotlar ko'lamini kengaytirish, iqtidorli yosh olimlarning innovatsion faoliyatini rag'batlantirish, mavjud ilmiy tashkilotlar salohiyatini yanada mustahkamlash va rivojlantirish. Ta'lim tizimiga yuqori samarali xalqaro amaliyotni joriy etish, Respublika ta'lim tashkilotlarini nufuzli xalqaro reytinglarga kiritish bo'yicha tizimli ishlarni amalga oshirish. Matematika fanlarini o'qitishda zamonaviy axborot texnologiyalaridan foydalanish metodikasi. Matematika fanlarini o'qitishga yangi texnik vositalar, shu jumladan, kompyuter va boshqa axborot texnologiyalarining jadal kirib kelayotgan hozirgi davrida fanlararo uzviylikni ta'minlash maqsadida informatika fani yutuqlaridan foydalanish dolzarb masalalardan biridir. Kompyuter texnikalarini ta'lim muassasalariga tatbiq etish, o'qitish jarayonini optimallashtirishga keng yo'l ochib beradi.

Matematika o'qitishda kompyuterlarni qulayligini yana bir yo'nalishi ayrim o'quv holatlarini modellashtirishdir. Modellashtirilgan dasturlardan foydalanishning maqsadi, o'qitishning boshqa usullari qo'llanganda tasavvur qilish, ko'z oldiga keltirilishi qiyin bo'lgan materiallarni tushunarli bo'lishini ta'minlashdan iborat. Modellashtirish yordamida o'quvchilarga ma'lumotlarni grafik rejimda kompyuter multimediasini ko'rinishida taqdim qilish mumkin. Shu boisdan ular matematikani chuqur o'rganish va o'quv jarayonida sezilarli darajada mustaqil namoyon etishga moyil bo'ladilar. Axborot texnologiyalaridan foydalanish o'quv motivatsiyasini rivojlantirish orqali dars samaradorligini oshiradi, bu esa o'quv jarayonini yanada muvaffaqiyatli qiladi. Matematika fanlarida kompyuter texnologiyalarining matematik paket dasturlaridan foydalanilmoqda. Hozirgi vaqtda ko'plab matematik paketlar yaratilgan va ulardan keng foydalanilmoqda. Ulardan eng ko'p tarqalganlari – bu Maple, Matlab, Mathlab, MicroSoft matematice, Derive, Eureka, Matematika paketlari hisoblanadi. Bu paketlar ko'p funksional paketlar hisoblanadi. Bugungi kunda matematik paketlarning o'quv jarayonidagi o'rni va roli ancha sezilarli va samaraliroqdir. O'quvchi-talabalarda matematik paketlardan foydalanish ko'nikmalari va malakalarini shakllantirish matematika va informatika fanlarining asosiy komponentalaridan biridir. Murakkab matematik masalalarni yechishni osonlashtirish

orqali matematikani o'rganishda asabiy siqilishni oldini oladi hamda uni qiziqarli va juda oddiy jarayonga aylantiradi. [2]

Quyida differensial tenglamalarni Maple matematik paketlari yordamida yechish masalalari qaraladi.

1-masala. $y' + y \cos x = \sin x \cos x$ differensial tenglamaning umumiy yechimini toping

> restart;

> de := diff(y(x), x) + y(x) * cos(x) = sin(x) * cos(x);

$$de := \frac{d}{dx} y(x) + y(x) \cos(x) = \sin(x) \cos(x)$$

> dsolve(de, y(x));

$$y(x) = \sin(x) - 1 + e^{-\sin(x)} _C1$$

2-masala. $y'' - y = x \cdot \sin x$ differensial tenglamaning umumiy yechimini toping

>

> dsolve(diff(y(x), x\$2) - y(x) = x * sin(x));

$$y(x) = e^x _C2 + e^{-x} _C1 - \frac{1}{2} \cos(x) - \frac{1}{2} x \sin(x)$$

3-masala. $y'' - 3y' + y = e^{-x} + x^3$ tenglamaning umumiy yechimi topilsin.

> restart;

> de := diff(y(x), x, x) - 3 * diff(y(x), x) + y(x) = exp(-x) + x^3;

$$de := \frac{d^2}{dx^2} y(x) - 3 \left(\frac{d}{dx} y(x) \right) + y(x) = e^{-x} + x^3$$

> dsolve(de, y(x));

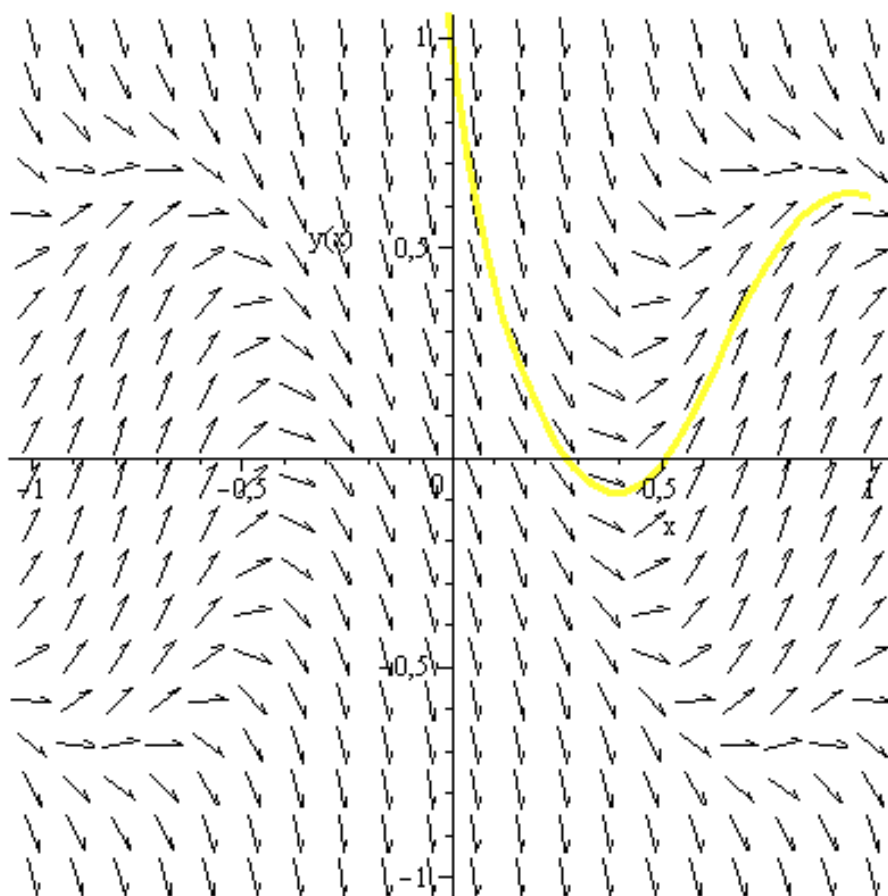
$$y(x) = e^{\frac{1}{2}(\sqrt{5}+3)x} _C2 + e^{-\frac{1}{2}(\sqrt{5}-3)x} _C1 + \left(\frac{1}{5} + (126 + x^3 + 9x^2 + 48x) e^x \right) e^{-x}$$

4-masala. $y' + 6y^2 + 3\cos(4x) = 0$ tenglamani $y(0)=1$ boshlang'ich shartdagi yechim grafigini yasang.

> restart

> with(DEtools)

> DEplot(diff(y(x), x) = -6 * y(x)^2 - 3 * cos(4 * x), y(x), x = -1 .. 1, y = -1 .. 1, [y(0) = 1], color = black)



5-masala. Ushbu $y'' - 2y' + y = \sin x \cdot e^{-x}$ ikkinchi tartibli differensial tenglamaning umumiy yechimini toping.

> restart;

> deq := diff(y(x), x\$2) - 2*diff(y(x), x) + y(x) = sin(x) * exp(-x);

$$deq := \frac{d^2}{dx^2} y(x) - 2 \left(\frac{d}{dx} y(x) \right) + y(x) = \sin(x) e^{-x}$$

> dsolve(deq, y(x));

$$y(x) = e^x _C2 + e^x x _C1 + \frac{1}{25} (4 \cos(x) + 3 \sin(x)) e^{-x}$$

6-masala. Ushbu $y'' - 2y' + y = \sin x + e^{-x}$ ikkinchi tartibli differensial tenglamaning umumiy yechimini toping.

> restart;

> deq := diff(y(x), x\$2) - 2*diff(y(x), x) + y(x) = sin(x) + exp(-x);

$$deq := \frac{d^2}{dx^2} y(x) - 2 \left(\frac{d}{dx} y(x) \right) + y(x) = \sin(x) + e^{-x}$$

> dsolve(deq, y(x));

$$y(x) = e^x _C2 + e^x x _C1 + \frac{1}{4} e^{-x} (2 \cos(x) e^x + 1)$$

7-masala. Ushbu $y'' + k^2 \cdot y = \sin(qx)$ tartibda berilgan differensial tenglamaning $q \neq k$ va $q = k$ (rezonans) ikki holda umumiy yechimini toping.

> restart;

> de := diff(y(x), x\$2) + k^2 · y(x) = sin(q · x);

$$de := \frac{d^2}{dx^2} y(x) + k^2 y(x) = \sin(q \cdot x)$$

> dsolve(de, y(x));

$$y(x) = \sin(k \cdot x) _C2 + \cos(k \cdot x) _C1 + \frac{\sin(q \cdot x)}{k^2 - q^2}$$

> q := k : dsolve(de, y(x));

$$y(x) = \sin(k \cdot x) _C2 + \cos(k \cdot x) _C1 - \frac{1}{2} \frac{\cos(k \cdot x) \cdot x}{k}$$

8-masala. Quyidagi berilgan differensial tenglamaning fundamental sistema yechimini toping:

$$y^{(4)} + 2y'' + y = 0.$$

> restart;

> de := diff(y(x), x\$4) + 2 · diff(y(x), x\$2) + y(x) = 0;

$$de := \frac{d^4}{dx^4} y(x) + 2 \left(\frac{d^2}{dx^2} y(x) \right) + y(x) = 0$$

> dsolve(de, y(x), output = basis);

$$[\cos(x), \sin(x), \cos(x) \cdot x, \sin(x) \cdot x]$$

>

9-masala. Koshi masalasining yechimini toping:

$$y^{(4)} + y'' = 2 \cos x, \quad y(0) = -2, \quad y'(0) = 1, \quad y''(0) = 0, \quad y'''(0) = 0.$$

> restart;

> de := diff(y(x), x\$4) + diff(y(x), x\$2) = 2 · cos(x);

$$de := \frac{d^4}{dx^4} y(x) + \frac{d^2}{dx^2} y(x) = 2 \cos(x)$$

> cond := y(0) = -2, D(y)(0) = 1, (D@@2)(y)(0) = 0, (D@@3)(y)(0) = 0;

$$cond := y(0) = -2, D(y)(0) = 1, D^{(2)}(y)(0) = 0, D^{(3)}(y)(0) = 0$$

> dsolve({de, cond}, y(x));

$$y(x) = -2 \cos(x) - \sin(x) \cdot x + x$$

10-masala. Quyidagi oddiy differensial tenglamaning yechimini turli analitik usullar yordamida Maple dasturidan foydalanib yeching:

$$\sin(x) y'(x) - \cos(x) y(x) = 0$$

> restart;

$$\begin{aligned} &> de := \sin(x) \cdot \text{diff}(y(x), x) - \cos(x) \cdot y(x) = 0 \\ &\quad de := \sin(x) \left(\frac{d}{dx} y(x) \right) - \cos(x) y(x) = 0 \end{aligned}$$

$$> \text{dsolve}(de, [linear], useInt);$$

$$y(x) = _CI e^{\int \frac{\cos(x)}{\sin(x)} dx}$$

$$> \text{value}(\%);$$

$$y(x) = _CI \sin(x)$$

$$> \text{dsolve}(de, [separable], useInt);$$

$$\int \frac{\cos(x)}{\sin(x)} dx - \left(\int^{y(x)} \frac{1}{_a} d_a \right) + _CI = 0$$

$$> \text{value}(\%);$$

$$\ln(\sin(x)) - \ln(y(x)) + _CI = 0$$

11-masala.Quyidagi differensial tenglamalar sistemasining umumiy yechimini toping:

$$\begin{cases} x' = -4x - 2y + \frac{2}{e^t - 1} \\ y' = 6x + 3y - \frac{3}{e^t - 1} \end{cases}$$

$$> \text{restart};$$

$$\begin{aligned} > sys := \text{diff}(x(t), t) = -4 \cdot x(t) - 2 \cdot y(t) + \frac{2}{\exp(t) - 1}, \text{diff}(y(t), t) \\ &\quad = 6 \cdot x(t) + 3 \cdot y(t) - \frac{3}{\exp(t) - 1}; \end{aligned}$$

$$\begin{aligned} sys := \frac{d}{dt} x(t) &= -4x(t) - 2y(t) + \frac{2}{e^t - 1}, \frac{d}{dt} y(t) = 6x(t) \\ &\quad + 3y(t) - \frac{3}{e^t - 1} \end{aligned}$$

$$> \text{dsolve}(\{sys\}, \{x(t), y(t)\});$$

$$\begin{aligned} \left\{ x(t) = \frac{2 + 2 \ln(e^t - 1) - _CI}{e^t} + _C2, y(t) = -2_C2 - 3e^{-t} \right. \\ \left. - 3e^{-t} \ln(e^t - 1) + \frac{3}{2} e^{-t} _CI \right\} \end{aligned}$$

XULOSA

Differensial tenglamalarni o‘qitishda kompyuter texnologiyalaridan foydalanish bu dars samaradorligini oshirishda, talabalar erkin misollarni ishlab uni kompyuter orqali tekshirish va kompyuterdan foydalanib Maple dasturi yordamida

geometrik obrazlarning grafiklarini yasash, talabalarga ko'pgina yengilliklar yaratib beradi.

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