BA’ZI AMALIY MASALALAR DIFFERENSIAL TENGLAMALARINI MATHCAD DASTURI YORDAMIDA SONLI YECHISH

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Annotatsiya: *ushbu tezisda amaliy ahamiyatga ega bo’lgan differansial tenglamalarni sonli yechishda mathcad dasturidan foydalanish yo’llari ko’rsatilgan bo’lib, bunga doir bir nechta misollar sonli yechib ko’rsatilgan.*

Annotation: *In this thesis, the ways of loading from the mathcad program in the numerical solution of differential equations, which have a practice, are indicators, and several examples of this are numerical solutions.*

Аннотация: *В данной диссертации способы загрузки из программы mathcad при численном решении дифференциальных уравнений, имеющие практику, являются индикаторами, и несколько примеров тому являются численными решениями.*

Kalit so’zlar: Differensial, hosila, rkfixed, integral, rkadapt, mathcad.

Key words: Differential, derivative, rkfixed, integral, rkadapt, mathcad.

Ключевые слова: Дифференциал, производная, rkfixed, интеграл, rkadapt, mathcad.

Birinchi tartibli hosilaga nisbatan yechilgan oddiy differensial tenglamalar yoki tenglamalar sistemasini yechish uchun o’zgarmas qadamli to’rtinchi tartibli Runge-Kutta usulini ifodalovchi *rkfixed* funksiyadan foydalaniladi, bu funksiya yozilishining umumiy ko’rinishi quyidagicha:

rkfixed(y, x_1, x_2, npoints, D)

bu yerda *y* – boshlang’ich shartlar vektori; [x_1, x_2] – integrallash intervali; npoints

– hisoblanadigan nuqtalar soni (boshlang’ich nuqta bunga kirmaydi); D – vektor (tenglamalar sistemasi o’ng tomonining vektor-funksiyasi).

1-misol. Mexanik sistema tebranishini ifodalovchi ushbu

$$\frac{dy}{dx} = sinx + \frac{1}{y}$$

oddiy differensial tenglamani $y(0)=1$ boshlang’ich shart uchun [0;6] intervalda Mathcad paketi yordamida yeching.

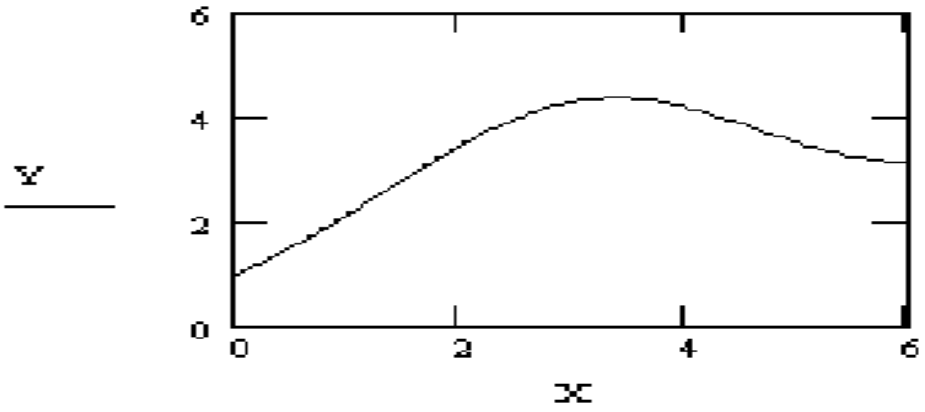
Yechish.

$y0 := 1$

$D(x,y) := \sin(x) + \frac{1}{y_0}$

$Z := rkfixed(y0, 0, 6, 100, D)$

$X := Z^{\langle 0 \rangle}$ $Y := Z^{\langle 1 \rangle}$



2-misol. Mexanik sistema tebranishini ifodalovchi ushbu

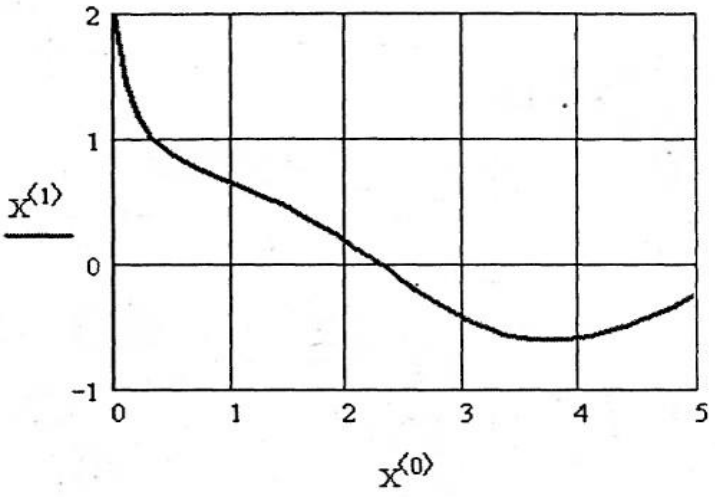
$$x' + x + x^3 = \cos(t)$$

oddiy differensial tenglamani $x(0)=2$ boshlang'ich shart Mathcad paketi yordamida yeching.

Yechish.

$D(t,x) := -x - x^3 + \cos(t)$

$X := rkfixed(2, 0, 5, 50, D)$



1) Birinchi tartibli hosilaga nisbatan yechilgan oddiy differensial tenglamalar yoki tenglamalar sistemasini yechish uchun avtomatik tanlanuvchan qadamli to'rtinchi tartibli Runge-Kutta usulini ifodalovchi *rkadapt* funksiyadan foydalaniladi, bu funksiya yozilishining umumiy ko'rinishi quyidagicha:

$$\text{rkadapt}(y, x_1, x_2, \text{eps}, D, \text{kmax}, \text{nt})$$

bu yerda y – boshlang'ich shartlar vektori; $[x_1, x_2]$ – integrallah intervali; eps – hisoblash aniqligi; D – vektor (tenglamalar sistemasi o‟ng tomonining vektor-funksiyasi); kmax – natija matritsasidagi satrlar soni (bitta nuqtada hisoblash uchun kmax=2); nt – integrallash qadamining minimal qiymati.

2) Birinchi tartibli hosilaga nisbatan yechilgan oddiy differensial tenglamalar yoki tenglamalar sistemasini yechish uchun to'rtinchi tartibli Runge-Kutta usulini ifodalovchi *Rkadapt* funksiyadan foydalaniladi, bu funksiya yozilishining umumiy ko‟rinishi quyidagicha:

$$\text{Rkadapt}(y, x_1, x_2, \text{npoints}, D)$$

Bu yerda y – boshlang'ich shartlar vektori; $[x_1, x_2]$ – integrallah intervali; npoints – hisoblanadigan nuqtalar soni (boshlang'ich nuqta bunga kirmaydi); D – vektor (tenglamalar sistemasi o'ng tomonining vektor-funksiyasi).

3-misol. Mexanik sistema tebranishini ifodalovchi ushbu

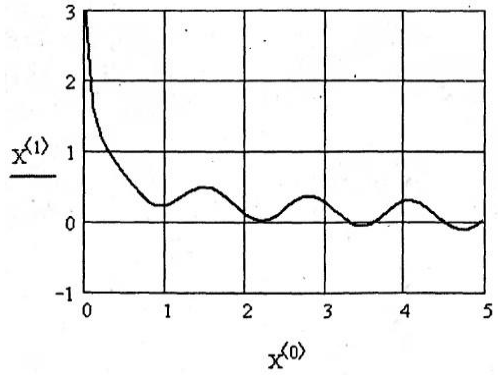
$$x' = -x^3 - x^2 + \cos(5t)$$

oddiy differensial tenglamani $x(0)=3$ boshlang'ich shart Mathcad paketi yordamida yeching.

Yechish.

$D(t,x) := -x^3 - x^2 + \cos(5t)$

$X := \text{Rkadapt}(3, 0, 5, 50, D)$



$X =$

	0	1
0	0	3
1	0.1	1.612
2	0.2	1.217
3	0.3	0.993
4	0.4	0.819
5	0.5	0.661
6	0.6	0.515
7	0.7	0.387
8	0.8	0.29
9	0.9	0.238
10	1	0.235
11	1.1	0.277
12	1.2	0.35
13	1.3	0.427
14	1.4	0.485
15	1.5	0.504

Ko’plab amaliy masalalar differensial tenglamasini analitik yechishda birmuncha murakkabliklarga duch kelinadi, shunday xolatlarda mathcad dasturi yordamida differensial tenglamalarning sonli yechimini toppish mumkin ekan.

FOYDALANILGAN ADABIYOTLAR RO’YXATI

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