

# Научное программирование

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## Лабораторная работа 3

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```
>> diary on
>> 2*6 + (7-4)^2
ans = 21
>> u = [1 -4 6]
u =

     1    -4     6

>> u = [1; -4; 6]
u =

     1
    -4
     6

>> A = [1 2 -3; 2 4 0; 1 1 1]
A =

     1     2    -3
     2     4     0
     1     1     1
```

Рис. 1: Простейшие операции 1

```
>> v = [2; 1; -1]
```

```
v =
```

```
2
```

```
1
```

```
-1
```

```
>> 2*v + 3*u
```

```
ans =
```

```
7
```

```
-10
```

```
16
```

```
>> dot(u, v)
```

```
ans = -8
```

```
>> cross(u, v)
```

```
ans =
```

```
-2
```

```
13
```

```
9
```

```
>> norm(u)
```

```
ans = 7.2801
```

```
>> u = [3 5]
u =
     3     5

>> v = [7 2]
v =
     7     2

>> proj = dot(u, v) / (norm(v))^2 * v
proj =
     4.0943     1.1698
```

Рис. 2: Вычисление проектора

# Матричные операции

```
>> A = [1 2 -3; 2 4 0; 1 1 1]
```

```
A =
```

```
1  2 -3
2  4  0
1  1  1
```

```
>> B = [1 2 3 4; 0 -2 -4 6; 1 -1 0 0]
```

```
B =
```

```
1  2  3  4
0 -2 -4  6
1 -1  0  0
```

```
>> A * B
```

```
ans =
```

```
-2  1 -5 16
 2 -4 -10 32
 2 -1 -1 10
```

```
>> B' * A
```

```
ans =
```

```
2  3 -2
-3 -5 -7
-5 -10 -9
16 32 -12
```

```
>> 2 * A - 4 * eye(3)
```

```
ans =
```

```
-2  4 -6
 4  4  0
 2  2 -2
```

```
>> det(A)
```

```
ans = 6
```

```
>> inv (A)
ans =

    0.6667    -0.8333     2.0000
   -0.3333     0.6667    -1.0000
   -0.3333     0.1667         0

>> eig (A)
ans =

    4.5251 + 0i
    0.7374 + 0.8844i
    0.7374 - 0.8844i

>> rank (A)
ans = 3
```

Рис. 3: Матричные операции

## Построение графиков - Прострейшие (команды)

```
>> x = linspace(0, 2*pi, 50)
x =

Columns 1 through 21:

    0    0.1282    0.2565    0.3847    0.5129    0.6411    0.7694    0.8976    1.0258    1.1541

Columns 22 through 42:

    2.6928    2.8210    2.9493    3.0775    3.2057    3.3339    3.4622    3.5904    3.7186    3.8468

Columns 43 through 50:

    5.3856    5.5138    5.6420    5.7703    5.8985    6.0267    6.1550    6.2832

>> y = sin(x)
y =

Columns 1 through 21:

    0    0.1279    0.2537    0.3753    0.4907    0.5981    0.6957    0.7818    0.8551    0.9144

Columns 22 through 42:

    0.4339    0.3151    0.1912    0.0641   -0.0641   -0.1912   -0.3151   -0.4339   -0.5455   -0.6482

Columns 43 through 50:

   -0.7818   -0.6957   -0.5981   -0.4907   -0.3753   -0.2537   -0.1279   -0.0000

>> plot(x, y)
```

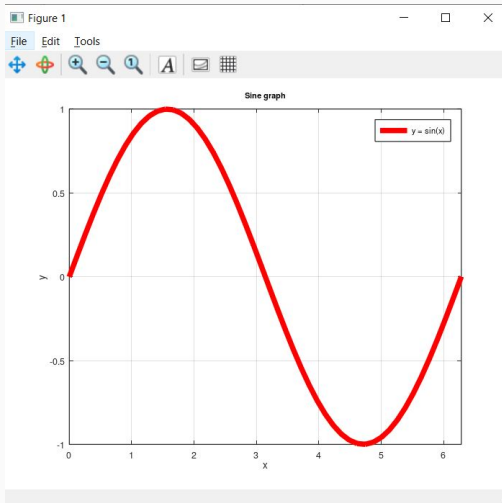
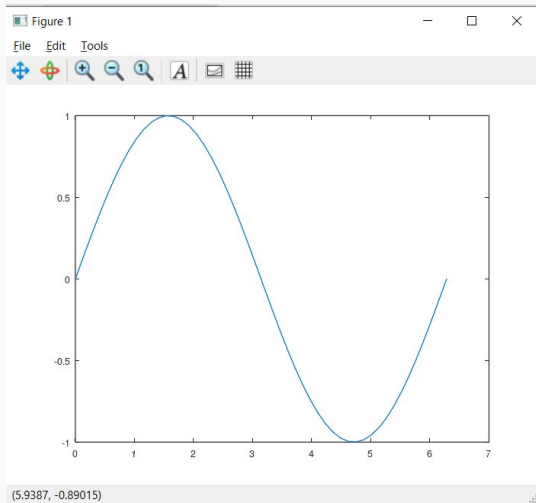
Рис. 4: График функции  $\sin x$



```
>> clf
>> plot(x, y, 'r', 'linewidth', 3)
>> axis([0 2*pi -1 1])
>> grid on
>> xlabel('x')
>> ylabel('y')
>> title('Sine graph')
>> legend('y = sin(x)')
```

Рис. 5: График функции  $\sin x$

# Построение графиков - Прострейшие (результат)



## Построение графиков - Два графика на одном чертеже (команды)

```
>> x = [1 2 3 4]
x =

     1     2     3     4

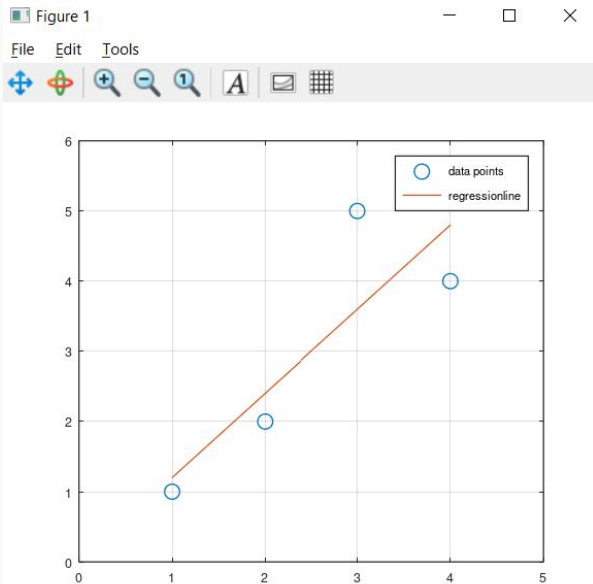
>> y = [1 2 5 4]
y =

     1     2     5     4

>> plot(x, y, 'o')
>> hold on
>> plot(x, 1.2*x)
>> grid on
>> axis([0 5 0 6])
>> legend('data points', 'regressionline')
```

Рис. 6: Два графика на одном чертеже

## Построение графиков - Два графика на одном чертеже (результат)



## Построение графиков - График $y = x^2 \sin x$ (команды)

```
>> clear
>> clf
>> x = linspace(-10, 10, 100)
x =

Columns 1 through 19:

-10.0000    -9.7980    -9.5960    -9.3939    -9.1919    -8.9899    -8.7879

Columns 20 through 38:

-6.1616    -5.9596    -5.7576    -5.5556    -5.3535    -5.1515    -4.9495

Columns 39 through 57:

-2.3232    -2.1212    -1.9192    -1.7172    -1.5152    -1.3131    -1.1111

Columns 58 through 76:

1.5152     1.7172     1.9192     2.1212     2.3232     2.5253     2.7273

Columns 77 through 95:

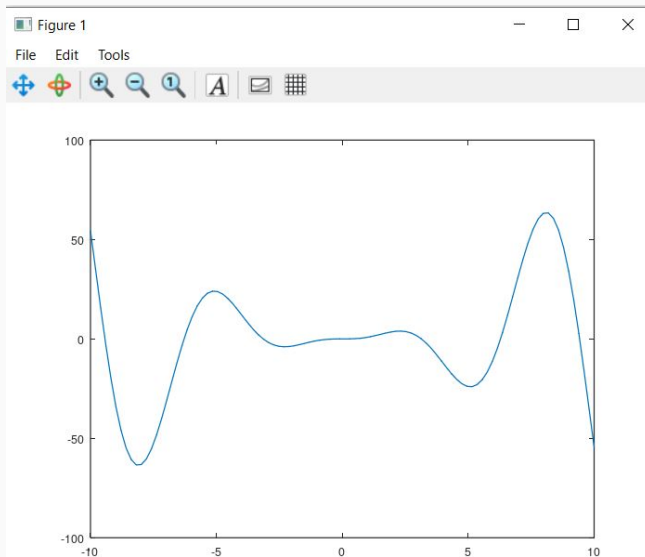
5.3535     5.5556     5.7576     5.9596     6.1616     6.3636     6.5657

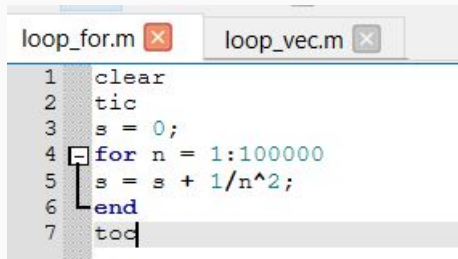
Columns 96 through 100:

9.1919     9.3939     9.5960     9.7980    10.0000

>> plot (x, x^2*sin(x))
error: for x^y, only square matrix arguments are permitted and one argume
>> plot (x, x.^2.*sin(x))
```

## Построение графиков - График $y = x^2 \sin x$ (результат)



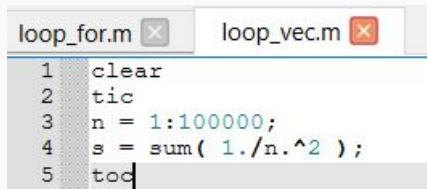


The image shows a screenshot of a MATLAB script editor with two tabs: 'loop\_for.m' (active) and 'loop\_vec.m'. The script in 'loop\_for.m' contains the following code:

```
1 clear
2 tic
3 s = 0;
4 for n = 1:100000
5     s = s + 1/n^2;
6 end
7 toc
```

The code calculates the sum of the reciprocals of the squares of integers from 1 to 100,000. It uses a 'for' loop to iterate through each integer 'n' and accumulates the value of 1/n^2 into the variable 's'. The execution time is measured using 'tic' and 'toc'.

Рис. 10: Документ 1



```
1 clear
2 tic
3 n = 1:1000000;
4 s = sum( 1./n.^2 );
5 toc
```

Рис. 11: Документ 2



```
>> clear
>>
>> clf
>> loop_for

Elapsed time is 0.110521 seconds.
>> loop_for

Elapsed time is 0.097578 seconds.
>> loop_for
Elapsed time is 0.0988259 seconds.
>> loop_vec

Elapsed time is 0.00908017 seconds.
>> loop_vec
Elapsed time is 0.000902891 seconds.
```

Рис. 12: Сравнение

## Выводы

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Ознакомилась с Octave. Научилась работать с векторами и матрицами, создавать отдельные документы для выполнения. Обрела навыки работы с различными графиками и их оформлением.

Спасибо за внимание!