**Решение**

Найдем определитель главной матрицы, составленной из коэффициентов при X1 - n:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 1 | | |  | | --- | | 1 | | | |  | | --- | | 3 | | |  | | --- | | -2 | | |  | | --- | | 1 | | |  | | --- | | -4 | | | |  | | --- | | 2 | | |  | | --- | | 2 | | |  | | --- | | -3 | | |  | | --- | | -4 | | | |  | | --- | | 2 | | |  | | --- | | -3 | | |  | | --- | | 1 | | |  | | --- | | 1 | | |  | | =     231 |  |

Определитель главной матрицы системы уравнений не равен нулю, следовательно данная система уравнений имеет единственное решение. Найдем его.  
Достоим главный определитель системы уравнений еще одним столбцом, в который вставим значения за знаком равенства.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 1 | | |  | | --- | | 1 | | |  | | --- | | 6 | | | |  | | --- | | 3 | | |  | | --- | | -2 | | |  | | --- | | 1 | | |  | | --- | | -4 | | |  | | --- | | -2 | | | |  | | --- | | 2 | | |  | | --- | | 2 | | |  | | --- | | -3 | | |  | | --- | | -4 | | |  | | --- | | 1 | | | |  | | --- | | 2 | | |  | | --- | | -3 | | |  | | --- | | 1 | | |  | | --- | | 1 | | |  | | --- | | 2 | | |  |

Теперь последовательно, при помощи [элементарных преобразований](http://www.webmath.ru/library/1_5.php) преобразуем левую часть матрицы (4 × 4) до треугольного вида (обнулим все коэффициенты находящиеся не на главной диагонали, а коэффициенты на главной диагонали преобразуем до единиц).

Вычтем 1 - ую строку из всех строк, которые находятся ниже нее. Это действие не противоречит элементарным преобразованиям матрицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 1 | | |  | | --- | | 1 | | |  | | --- | | 6 | | | |  | | --- | | 0 | | |  | | --- | | -4 | | |  | | --- | | 0 | | |  | | --- | | -5 | | |  | | --- | | -8 | | | |  | | --- | | 0 | | |  | | --- | | 0.67 | | |  | | --- | | -3.67 | | |  | | --- | | -4.67 | | |  | | --- | | -3 | | | |  | | --- | | 0 | | |  | | --- | | -4.33 | | |  | | --- | | 0.33 | | |  | | --- | | 0.33 | | |  | | --- | | -2 | | |  |

Вычтем 2 - ую строку из всех строк, которые находятся ниже нее. Это действие не противоречит элементарным преобразованиям матрицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 1 | | |  | | --- | | 1 | | |  | | --- | | 6 | | | |  | | --- | | 0 | | |  | | --- | | -4 | | |  | | --- | | 0 | | |  | | --- | | -5 | | |  | | --- | | -8 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -3.67 | | |  | | --- | | -5.5 | | |  | | --- | | -4.33 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0.33 | | |  | | --- | | 5.75 | | |  | | --- | | 6.67 | | |  |

Вычтем 3 - ую строку из всех строк, которые находятся ниже нее. Это действие не противоречит элементарным преобразованиям матрицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 1 | | |  | | --- | | 1 | | |  | | --- | | 6 | | | |  | | --- | | 0 | | |  | | --- | | -4 | | |  | | --- | | 0 | | |  | | --- | | -5 | | |  | | --- | | -8 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -3.67 | | |  | | --- | | -5.5 | | |  | | --- | | -4.33 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 5.25 | | |  | | --- | | 6.27 | | |  |

Вычтем 4 - ую строку из всех строк, которые находятся выше нее. Это действие не противоречит элементарным преобразованиям матрицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 1 | | |  | | --- | | 0 | | |  | | --- | | 4.81 | | | |  | | --- | | 0 | | |  | | --- | | -4 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -2.03 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -3.67 | | |  | | --- | | 0 | | |  | | --- | | 2.24 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 5.25 | | |  | | --- | | 6.27 | | |  |

Вычтем 3 - ую строку из всех строк, которые находятся выше нее. Это действие не противоречит элементарным преобразованиям матрицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 2 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 5.42 | | | |  | | --- | | 0 | | |  | | --- | | -4 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -2.03 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -3.67 | | |  | | --- | | 0 | | |  | | --- | | 2.24 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 5.25 | | |  | | --- | | 6.27 | | |  |

Вычтем 2 - ую строку из всех строк, которые находятся выше нее. Это действие не противоречит элементарным преобразованиям матрицы.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 3 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 4.4 | | | |  | | --- | | 0 | | |  | | --- | | -4 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -2.03 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | -3.67 | | |  | | --- | | 0 | | |  | | --- | | 2.24 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 5.25 | | |  | | --- | | 6.27 | | |  |

Приведем все коэффициенты на главной диагонали матрицы к 1. Поделим каждую строку матрицы на коэффициент этой строки находящийся на главной диагонали, если он не равен 1.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | |  | | --- | | 1 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 1.47 | | | |  | | --- | | 0 | | |  | | --- | | 1 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0.51 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 1 | | |  | | --- | | -0 | | |  | | --- | | -0.61 | | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 0 | | |  | | --- | | 1 | | |  | | --- | | 1.19 | | |  |

**Ответ**.

Числа получившиеся правее единичной матрицы и будут решением Вашей системы уравнений.

|  |
| --- |
| x 1  =   1.47 |
| x 2  =   0.51 |
| x 3  =   -0.61 |
| x 4  =   1.19 |