

Optimization prize 1

Monday, October 27, 2025 1:03 PM

4x4 matrix

1 2 3 4

1

2

3

4

constraints

[1][1]=2

[2][2]=1

[3][3]=4

[4][4]=1

$[x][y]$

$[1][4] = 3$

$[4][1] = 5$

2 x_{21} x_{31} 3

x_{12} 1 x_{32} x_{42}

x_{13} x_{23} 4 x_{43}

3 x_{24} x_{34} 1

$2 + x_{21} + x_{31} + 3 = 10 \rightarrow x_{21} + x_{31} = 5$

$x_{12} + 1 + x_{32} + x_{42} = 10 \rightarrow x_{12} + x_{32} + x_{42} = 9$

$x_{13} + x_{23} + 4 + x_{43} = 10 \rightarrow x_{13} + x_{23} + x_{43} = 6$

$3 + x_{24} + x_{34} + 1 = 10 \rightarrow x_{24} + x_{34} = 6$

$2 + x_{12} + x_{13} + 3 = 10 \rightarrow x_{12} + x_{13} = 5$

$x_{21} + 1 + x_{23} + x_{24} = 10 \rightarrow x_{21} + x_{23} + x_{24} = 9$

$x_{31} + x_{32} + 4 + x_{34} = 10 \rightarrow x_{31} + x_{32} + x_{34} = 6$

$3 + x_{42} + x_{43} + 1 = 10 \rightarrow x_{42} + x_{43} = 6$

2 1 1 3

1 1 4 1

3 1 1 1

1 x_{21} x_{31} 1

x_{12} 1 x_{32} x_{42}

x_{13} 1 1 x_{43}

1 x_{24} x_{34} 1

10 $x_{11} - x_{13} + 2x_{24} + 11$

7

$-7x_{13}$

9

2 [0,5] [0,5] 3

[0,5] 1 [0,6]

[0,5] 4 [0,6]

3 [0,6] [0,6] 1

gaps are nonnegative continuous aka floats

2	a	b	3
c	1	d	e
f	g	4	h
3	i	j	1

function that
takes row column pairs
where their are gaps provide ranges that satisfy row[i] column[j] both = 10

flow :

1 : 4

2 : 4

3 : 4

4 : 4

20 lines

5x4 @ [2, a, b, 3]

=> set a and b ranges that satisfy 2 + a + b + 3 = 10

a + b = 5 [0, 5]

2 x_1 [0,5] [0,5] 3

[0,5] 1 [0,6]

[0,5] 4 [0,6]

3 x_2 [0,6] [0,6] 1

$x_1 + x_2 = 10$

$2x_2 =$

2	2.5	2.5	3
2.5	1	0.5	3
2.5	0.5	4	3
3	7	3	1

10 4 14 10

we set one quarter than mid point and one lower

2 3.25 1.75 3

2.5 1.5 3.25 1

1.75 4

3 1

Start

2 [0,5] [0,5] 3

[0,5] 1 [0,6]

[0,5] 4 [0,6]

3 [0,6] [0,6] 1

lower & upper bound Symmetry

2 [2.5,5] [0,2.5] 3

[2.5,5] 1 [0,3.5] [3,6]

[0,2.5] [0,3.5] 4 [0,3]

3 [3,6] [0,3] 1

2 3.75 1.25 3 10

3.75 1 1.75 2.5 11 -1

1.25 1.75 4 1.5 8.5 41

3 4.5 1.5 1 10

10 11 8.5 10

-1 41

2 3.75 1.25 3 10

3.75 1 1.75 3.5 10

1.25 1.75 4 2.5 9.5 +0.5

3 3.5 2.5 1 10

10 10 9.5 10

+0.5

2 3.75 1.25 3 10

3.25 1 2.25 3.5 10

1.25 2.25 4 2.5 10

3 3.5 2.5 1 10

4.5 10.5 10 10

2 3.75 1.25 3 10

3.25 1 2.25 3.5 10

1.75 1.75 4 2.5 10

3 3.5 2.5 1 10

10 10 10 10