

Программа PARAM.EXE

Исследование операций
с применением компьютера
Версия 2.00a (2007)

PARAMETRIC LINEAR PROGRAMMING
Reading problem from a file

PARAM / 2

Type of problem :

Parameterization of :

Number of variables (max.20) Number of the constraints (max.20)

(c+	<input type="text" value="2.00"/>	<input type="text" value="3.00"/>
c't)x	<input type="text" value="1.00"/>	<input type="text" value="-1.00"/>

	x(1)	x(2)		b
1	<input type="text" value="2.00"/>	<input type="text" value="2.00"/>	<input type="text" value="≤"/>	<input type="text" value="14.00"/>
2	<input type="text" value="1.00"/>	<input type="text" value="2.00"/>	<input type="text" value="≤"/>	<input type="text" value="8.00"/>
3	<input type="text" value="4.00"/>	<input type="text" value="0.00"/>	<input type="text" value="≤"/>	<input type="text" value="16.00"/>

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM /3

Initial value of t

Type of problem : MAXIMIZATION MINIMIZATION

Parameterization of : OBJECTIVE FUNCTION RIGHT-HAND SIDE

Number of variables (max.20) 2 Number of the constraints (max.20) 3

(c+	-2.00	-3.00
c't)x	1.00	-1.00

	x(1)	x(2)		b
1	0.00	0.00	≤	2.00
2	0.00	1.00	≤	2.00
3	1.00	0.00	≤	4.00

Enter initial value of t:

0.00

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM /4

Iteration 1

$(c + c't)x \rightarrow \max$			2.00	3.00	0.00	0.00	0.00	Vector of const.
			1.00	-1.00	0.00	0.00	0.00	
Basis	c(B)	c't(B)	x(1)	x(2)	x(3)	x(4)	x(5)	
x(3)	0.00	0.00	0.00	0.00	1.00	-1.00	-0.25	2.00
x(2)	3.00	-1.00	0.00	1.00	0.00	0.50	-0.13	2.00
x(1)	2.00	1.00	1.00	0.00	0.00	0.00	0.25	4.00
$(c-z) + (c'-z')t$			0.00	0.00	0.00	-1.50	-0.13	
			0.00	0.00	0.00	0.50	-0.38	

$$\begin{array}{rcl} -1.50 + 0.50*t & \leq & 0.00 \\ -0.13 + -0.38*t & \leq & 0.00 \end{array}$$

Enter values of t, for which the solution is optimal

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM /5

Iteration 1

$(c + c't)x \rightarrow \max$			2.00	3.00	0.00	0.00	0.00	Vector of const.
			1.00	-1.00	0.00	0.00	0.00	
Basis	c(B)	c't(B)	x(1)	x(2)	x(3)	x(4)	x(5)	
x(3)	0.00	0.00	0.00	0.00	1.00	-1.00	-0.25	2.00
x(2)	3.00	-1.00	0.00	1.00	0.00	0.50	-0.13	2.00
x(1)	2.00	1.00	1.00	0.00	0.00	0.00	0.25	4.00
$(c-z) + (c'-z')t$			0.00	0.00	0.00	-1.50	-0.13	
			0.00	0.00	0.00	0.50	-0.38	

Values of t for which the solution remains optimal

Lower range limit	Upper range limit
-0.3333333333	3.0000000000

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM /6

Iteration 2

cx → max		5.00	0.00	0.00	0.00	0.00	Vector of const.
Basis	c(B)	x(1)	x(2)	x(3)	x(4)	x(5)	
x(3)	0.00	0.00	0.00	1.00	-1.00	-0.25	2.00
x(2)	0.00	0.00	1.00	0.00	0.50	-0.13	2.00
x(1)	5.00	1.00	0.00	0.00	0.00	0.25	4.00
c-z		0.00	0.00	0.00	0.00	-1.25	

Value of the optimality coefficient =

0.0000000000

Value of t =

3.0000000000

Select the variable entering the basis

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM /7

Iteration 2

cx → max		5.00	0.00	0.00	0.00	0.00	Vector of const.
Basis	c(B)	x(1)	x(2)	x(3)	x(4)	x(5)	
x(3)	0.00	0.00	0.00	1.00	-1.00	-0.25	2.00
x(2)	0.00	0.00	1.00	0.00	0.50	-0.13	2.00
x(1)	5.00	1.00	0.00	0.00	0.00	0.25	4.00
c-z		0.00	0.00	0.00	0.00	-1.25	

Value of t =

3.0000000000

Does the selected variable indicate unbounded objective function ? Yes

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM /8

Iteration 2

Basis	Vector of const.	Coefficients for variable(4)	Vector of ratios
x(3)	2.0000	-1.0000	-2.000000000
x(2)	2.0000	0.5000	4.000000000
x(1)	4.0000	0.0000	undefined

Coefficient =

4.0000000000

Select the variable leaving the basis

Ranges for t

Lower range limit	Upper range limit
none	-0.3333333333
-0.3333333333	3.0000000000
3.0000000000	none

PARAMETRIC LINEAR PROGRAMMING
Reading problem from a file

PARAM/10

Type of problem : MAXIMIZATION MINIMIZATION

Parameterization of : OBJECTIVE FUNCTION RIGHT-HAND SIDE

Number of variables (max.20) 2 Number of the constraints (max.20) 3

CX 2.00 3.00

x(1) x(2) b+ b't

1	2.00	2.00	≤	14.00	-9.00
2	1.00	2.00	≤	8.00	-4.00
3	4.00	0.00	≤	16.00	8.00

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM/11

Initial value of t

Type of problem : MAXIMIZATION MINIMIZATION

Parameterization of : OBJECTIVE FUNCTION RIGHT-HAND SIDE

Number of variables (max.20) 2 Number of the constraints (max.20) 3

CX -2.00 -3.00

	x(1)	x(2)		b+	b' t
1	0.00	0.00	<	2.00	-9.00
2	0.00	1.00	<	2.00	-4.00
3	1.00	0.00	<	4.00	8.00

Enter initial value of t:

0.00

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM/12

Iteration 1

cx \rightarrow max		2.00	3.00	0.00	0.00	0.00	Vector of constraints b+b't	
Basis	c(B)	x(1)	x(2)	x(3)	x(4)	x(5)		
x(3)	0.00	0.00	0.00	1.00	-1.00	-0.25	2.00	-7.00
x(2)	3.00	0.00	1.00	0.00	0.50	-0.13	2.00	-3.00
x(1)	2.00	1.00	0.00	0.00	0.00	0.25	4.00	2.00
c-z		0.00	0.00	0.00	-1.50	-0.13		

$$\begin{aligned}
 2.00 + -7.00*t &\geq 0.00 \\
 2.00 + -3.00*t &\geq 0.00 \\
 4.00 + 2.00*t &\geq 0.00
 \end{aligned}$$

Enter values of t, for which the solution is feasible

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM/13

Iteration 1

cx \rightarrow max		2.00	3.00	0.00	0.00	0.00	Vector of constraints b+b't	
Basis	c(B)	x(1)	x(2)	x(3)	x(4)	x(5)		
x(3)	0.00	0.00	0.00	1.00	-1.00	-0.25	2.00	-7.00
x(2)	3.00	0.00	1.00	0.00	0.50	-0.13	2.00	-3.00
x(1)	2.00	1.00	0.00	0.00	0.00	0.25	4.00	2.00
c-z		0.00	0.00	0.00	-1.50	-0.13		

Values of t for which the solution remains feasible

Lower range limit	Upper range limit
-2.0000000000	0.2857142857

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM/14

Iteration 2

cx \rightarrow max		2.00	3.00	0.00	0.00	0.00	Vector of const.
Basis	c(B)	x(1)	x(2)	x(3)	x(4)	x(5)	
x(3)	0.00	0.00	0.00	1.00	-1.00	-0.25	0.00
x(2)	3.00	0.00	1.00	0.00	0.50	-0.13	1.14
x(1)	2.00	1.00	0.00	0.00	0.00	0.25	4.57
c-z		0.00	0.00	0.00	-1.50	-0.13	

Value of the optimality coefficient =

0.0000000000

Value of t =

0.2857142857

Select the variable leaving the basis

PARAMETRIC LINEAR PROGRAMMING
Solving the problem

PARAM/15

Iteration 2

cx \rightarrow max		2.00	3.00	0.00	0.00	0.00	Vector of const.
Basis	c(B)	x(1)	x(2)	x(3)	x(4)	x(5)	
x(3)	0.00	0.00	0.00	1.00	-1.00	-0.25	0.00
x(2)	3.00	0.00	1.00	0.00	0.50	-0.13	1.14
x(1)	2.00	1.00	0.00	0.00	0.00	0.25	4.57
c-z		0.00	0.00	0.00	-1.50	-0.13	

Value of t =

0.2857142857

Does the selected variable indicate problem infeasibility ? Yes No

Iteration 2

Variables	Vector of optimality coefficients	Row of coefficients for row 1	Vector of ratios
x(1)	0.0000	0.0000	undefined
x(2)	0.0000	0.0000	undefined
x(3)	0.0000	1.0000	undefined
x(4)	-1.5000	-1.0000	1.50000000
x(5)	-0.1250	-0.2500	0.50000000

Coefficient =

0.5000000000

Select the variable entering the basis

Ranges for t

Lower range limit	Upper range limit
none	-2.0000000000
-2.0000000000	0.2857142857
0.2857142857	1.2000000000
1.2000000000	1.5555555556
1.5555555556	none