NTNU

Kunnskap for en bedre verden

TIØ4120 - Operasjonsanalyse, grunnkurs

Exercise #3

Author:
Sondre Pedersen

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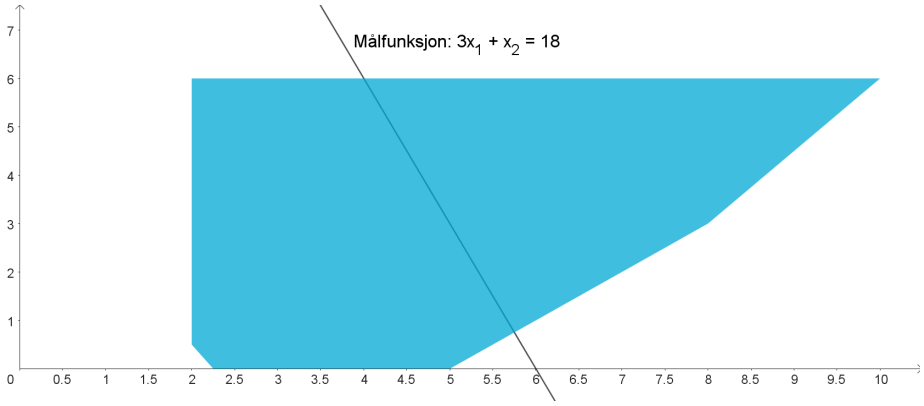
Oppgave 1

a)



Mulighetsområdet med en vilkårlig valgt målfunksjon

b

Øving 3

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Oppgave 1

b)

$$
\begin{aligned}
\max \quad & 3x_1 + x_2 && && (0)\\
\text{s.t.} \quad & x_1 - x_2 && \le 5 && (1)\\
& 3x_1 - 2x_2 && \le 18 && (2)\\
& 4x_1 + 2x_2 && \ge 9 && (3)\\
& x_2 && \le 6 && (4)\\
& x_1 && \ge 2 && (5)\\
& x_2 && \ge 0 && (6)
\end{aligned}
$$

Må legge til kunstvariabler for (3) og (5). Så vi får:

$$
\begin{aligned}
z - 3x_1 - x_2 \qquad\qquad & - Ma_1 - Ma_2 = 0\\
x_1 - x_2 + s_1 \qquad\qquad & = 5\\
3x_1 - 2x_2 + s_2 \qquad\qquad & = 18\\
4x_1 + 2x_2 - s_3 + a_1 \qquad\qquad & = 9\\
x_2 + s_4 \qquad\qquad & = 6\\
x_1 - s_5 + a_2 & = 2
\end{aligned}
$$

Basis variable	Eq	z	x_1	x_2	s_1	s_2	s_3	s_4	s_5	a_1	a_2	RHS	Forhold - test
z	(0)	1	-4M	-5M	-3M	0	M	0	M	0	0	-11M	
s_1	(1)	0	1	-1	1	0	0	0	0	0	0	5	5/1 = 5
s_2	(2)	0	3	-2	0	1	0	0	0	0	0	18	18/3 = 6
a_1	(3)	0	4	2	0	0	-1	0	0	1	0	9	9/4 = 2.25
s_4	(4)	0	0	1	0	0	0	1	0	0	0	6	
a_2	(5)	0	1	0	0	0	0	0	-1	0	1	2	2/1 = 2
z	(0)	1	-2M	0	0	M	0	0	-M	0	5M	-M + 4	
s_1	(1)	0	0	-1	1	0	0	0	1	0	-1	3	3
s_2	(2)	0	0	-2	0	1	0	0	3	0	-3	12	4
a_1	(3)	0	0	2	0	0	-1	0	4	1	-4	1	0.25
s_4	(4)	0	0	1	0	0	0	1	0	0	0	6	
x_1	(5)	0	1	0	0	0	0	0	-1	0	1	2	-2
z	(0)	1	0	1/2	0	0	-3/4	0	0	0.75	M	6.75	
s_1	(1)	0	0	-3/2	1	0	1/4	0	0	-1/4	0	2.25	11
s_2	(2)	0	0	-7/2	0	1	3/4	0	1	-3/4	0	11.25	15
s_6	(3)	0	0	1/2	0	0	-1/4	1	0	1/4	-1	0.25	-1
s_4	(4)	0	1	1	0	0	0	0	0	0	0	6	
x_1	(5)	0	0	1/2	0	0	-3/4	0	0	1/4	0	2.75	-9
z	(0)	1	0	-4	3	0	0	0	0	M	M	18	
s_3	(1)	0	0	-6	4	0	1	0	0	-1	0	11	-1.83
s_2	(2)	0	0	1	-1	1	0	0	0	0	0		3
s_6	(3)	0	0	-1	1	0	0	0	1	-1	-1		-3
s_4	(4)	0	0	1	0	0	0	1	0	0	0		6
x_1	(5)	0	1	-1	1	0	0	0	0	0	0		-5
z	(0)	1	0	0	-9	4	0	0	0	M	M	27	
s_3	(1)	0	0	0	-14	6	1	0	0	-1	0	29	-2.07
x_2	(2)	0	0	1	-3	1	0	0	0	0	0	3	-1
s_6	(3)	0	0	0	-2	1	0	0	1	0	-1	6	-3
s_4	(4)	0	0	0	3	-1	0	1	0	0	0	3	1
x_1	(5)	0	1	0	-2	1	0	0	0	0	0	8	-4
z	(0)	1	0	0	0	1	0	3	0	M	M	36	
s_3	(1)	0	0	0	0	1.33	1	4.67	0	-1	0	43	
x_2	(2)	0	0	1	0	0	0	1	0	0	0	6	
s_6	(3)	0	0	0	0	0.33	0	0.67	1	0	-1	8	
s_1	(4)	0	0	0	1	-0.33	0	0.33	0	0	0	1	
x_1	(5)	0	1	0	0	0.33	0	0.67	0	0	0	10	

$z = 36$

$(x_1, x_2) = (10, 6)$

Oppgave 2

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a)

$\min z = 4x_1 + 8x_2 + 3x_3$

når

$x_1 + x_2 \geq 2$

$2x_2 + x_3 \geq 5$

$x_1, x_2, x_3 \geq 0$

Blir til

$z = 4x_1 + 8x_2 + 3x_3 + Ma_1 + Ma_2$ (a)

$x_1 + x_2 - s_1 + a_1 = 2$ (1)

$2x_2 + x_3 - s_2 + a_2 = 5$ (2)

b)

Basis-variable	Eqn	z	x_1	x_2	x_3	s_1	s_2	a_1	a_2	RHS	Forhold-test
z	(0)	1	$\frac{M}{-4}$	$\frac{2M}{-8}$	$\frac{M}{-3}$	$-M$	$-M$	0	0	$7M$	
a_1	(1)	0	1	1	0	-1	0	1	0	2	2
a_2	(2)	0	0	2	1	0	-1	0	1	5	2,5
z	(0)	1	$\frac{-2M}{+4}$	0	$\frac{M}{-3}$	$\frac{2M}{-8}$	$-M$	$\frac{-2M}{+8}$	0	$M+16$	
x_2	(1)	0	1	1	0	-1	0	1	0	2	2
a_2	(2)	0	-2	0	1	2	-1	-2	1	1	0.5
z	(0)	1	-4	0	1	0	$-4-M$	$\frac{-M}{+4}$		20	
x_2	(1)	0	0	1	$\frac{1}{2}$	0	$-\frac{1}{2}$	0	$\frac{1}{2}$	2.5	5
s_1	(2)	0	-1	0	$\frac{1}{2}$	1	$\frac{1}{2}$	-1	$-\frac{1}{2}$	0.5	1
z	(0)	1	-2	0	0	-2	-3	$\frac{-M}{+2}$	$\frac{-M}{+3}$	19	
x_2	(1)	0	1	1	0	-1	0	1	0	2	
x_3	(2)	0	-2	0	1	2	-1	-2	1	1	

$z = 19$

$(x_1, x_2, x_3) = (0, 2, 1)$