Assignment-3

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Phase-I:

	z	a_1	x_1	x_2	s_1	s_2	s_3	
	1	1	0	0	0	0	0	0
a_1	0	1	2	1	-1	0	0	2
s_2	0	0	1	3	0	1	0	2
s_3	0	0	0	1	0	0	1	4

		z	a_1	x_1	x_2	s_1	s_2	s_3	
		1	0	-2	-1	1	0	0	-2
$*$	a_1	0	1	2	1	-1	0	0	2
	s_2	0	0	1	3	0	1	0	2
	s_3	0	0	0	1	0	0	1	4

	z	a_1	x_1	x_2	s_1	s_2	s_3	
	1	1	0	$-1+1=0$	$1+(-1)=0$	0	0	$-2+2=0$
x_1	0	1	2	1	-1	0	0	2
s_2	0	-1	0	$3\times 2-1=5$	$-(-1)=1$	$1\times 2=2$	0	$2\times 2-2=2$
s_3	0	0	0	1	0	0	1	4

Phase-II:

	z	x_1	x_2	s_1	s_2	s_3	
	1	-3	1	0	0	0	0
x_1	0	2	1	-1	0	0	2
s_2	0	0	5	1	2	0	2
s_3	0	0	1	0	0	1	4

		z	x_1	x_2	s_1	s_2	s_3	
		$1\times 2=2$	0	$1\times 2+1\times 3=5$	$(-1)\times 3=-3$	0	0	$2\times 3=6$
	x_1	0	2	1	-1	0	0	2
$*$	s_2	0	0	5	1	2	0	2
	s_3	0	0	1	0	0	1	4

	z	x_1	x_2	s_1	s_2	s_3	
	2	0	$5+5\times 3=20$	0	$2\times 3=6$	0	$6+2\times 3=12$
x_1	0	2	$1+5=6$	0	$0+2=2$	0	$2+2=4$
s_1	0	0	5	1	2	0	2
s_3	0	0	1	0	0	1	4

$$\begin{pmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_1 \\ s_1 \\ s_3 \end{pmatrix} = \begin{pmatrix} 4 \\ 2 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} x_1 \\ s_1 \\ s_3 \end{pmatrix} = \begin{pmatrix} 2 \\ 2 \\ 4 \end{pmatrix}$$

$$\therefore \quad x_1 = 2,\ x_2 = 0,\ \max(3x_1 - x_2) = \frac{12}{2} = 6$$

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Phase-I:

		z	a_1	a_2	x_1	x_2	s_1	s_2	s_3	
		1	1	1	0	0	0	0	0	0
	a_1	0	1	0	3	2	-1	0	0	3
	a_2	0	0	1	1	4	0	-1	0	4
	s_3	0	0	0	1	1	0	0	1	5

		z	a_1	a_2	x_1	x_2	s_1	s_2	s_3	
		1	0	0	$-3-1=-4$	$-2-4=-6$	$-(-1)=1$	$-(-1)=1$	0	$-3-4=-7$
	a_1	0	1	0	3	2	-1	0	0	3
$*$	a_2	0	0	1	1	4	0	-1	0	4
	s_3	0	0	0	1	1	0	0	1	5

		z	a_1	a_2	x_1	x_2	s_1	s_2	s_3	
		$1\times 2=2$	0	$1\times 3=3$	$-4\times 2+1\times 3=-5$	0	$1\times 2=2$	$1\times 2+(-1)\times 3=-1$	0	$-7\times 2+4\times 3$
$*$	a_1	0	$1\times 2=2$	-1	$3\times 2-1=5$	0	$-1\times 2=-2$	$-(-1)=1$	0	$3\times 2-4=$
	x_2	0	0	1	1	4	0	-1	0	4
	s_3	0	0	-1	$1\times 4-1=3$	0	0	$-(-1)=1$	$1\times 4=4$	$5\times 4-4=$

		z	a_1	a_2	x_1	x_2	s_1	s_2	s_3	
		2	2	$3+(-1)=2$	0	0	$2+(-2)=2$	$-1+1=0$	0	$-2+2=0$
	x_1	0	2	-1	5	0	-2	1	0	2
	x_2	0	$0-2=-2$	$1\times 5-(-1)=6$	0	$4\times 5=20$	$0-(-2)=2$	$-1\times 5-1=-6$	0	$4\times 5-2=18$
	s_3	0	$-2\times 3=-6$	$-1\times 5-(-1)\times 3=-2$	0	0	$-(-2)\times 3=6$	$1\times 5-1\times 3=2$	$4\times 5=20$	$16\times 5-2\times 3=$

Phase-II:

		z	x_1	x_2	s_1	s_2	s_3	
		1	-5	-8	0	0	0	0
	x_1	0	5	0	-2	1	0	2
	x_2	0	0	$\frac{20}{2}=10$	$\frac{2}{2}=1$	$\frac{-6}{2}=-3$	0	$\frac{18}{2}=9$
	s_3	0	0	0	$\frac{6}{2}=3$	$\frac{2}{2}=1$	$\frac{20}{2}=10$	$\frac{74}{2}=37$

		z	x_1	x_2	s_1	s_2	s_3	
		5	0	0	$(-2)\times 5+1\times 4=-6$	$1\times 5+(-3)\times 4=-7$	0	$2\times 5+9\times 4=46$
$*$	x_1	0	5	0	-2	1	0	2
	x_2	0	0	10	1	-3	0	9
	s_3	0	0	0	3	1	10	37

		z	x_1	x_2	s_1	s_2	s_3	
		5	$5\times 7=35$	0	$-6+(-2)\times 7=-20$	0	0	$46+2\times 7=60$
	s_2	0	5	0	-2	1	0	2
	x_2	0	$5\times 3=15$	10	$1+(-2)\times 3=-5$	0	0	$9+2\times 3=15$
$*$	s_3	0	-5	0	$3-(-2)=5$	0	10	$37-2=35$

		z	x_1	x_2	s_1	s_2	s_3	
		5	$35+(-5)\times 4=15$	0	0	0	$10\times 4=40$	$60+35\times 4=200$
	s_2	0	$5\times 5+(-5)\times 2=15$	0	0	$1\times 5=5$	$10\times 2=20$	$2\times 5+35\times 2=80$
	x_2	0	$15+(-5)=10$	10	0	0	10	$15+35=50$
	s_1	0	-5	0	5	0	10	35

$$\begin{pmatrix} 5 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 5 \end{pmatrix} \begin{pmatrix} s_2 \\ x_2 \\ s_1 \end{pmatrix} = \begin{pmatrix} 80 \\ 50 \\ 35 \end{pmatrix}$$

$$\begin{pmatrix} s_1 \\ x_2 \\ s_1 \end{pmatrix} = \begin{pmatrix} 16 \\ 5 \\ 7 \end{pmatrix}$$

$$\therefore \quad x_1 = 0,\ x_2 = 5,\ \max\left(5x_1 + 8x_2\right) = \frac{200}{5} = 40$$

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