

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

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

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

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

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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	$-7 \times 2 + 4 \times 3 = -2$
a_1	0	$1 \times 2 = 2$	-1	$3 \times 2 - 1 = 5$	0	$-1 \times 2 = -2$	$-(-1) = 1$	0	$3 \times 2 - 4 = 2$
a_2	0	0	1	1	4	0	-1	0	4
s_3	0	0	-1	$1 \times 4 - 1 = 3$	0	0	$-(-1) = 1$	$1 \times 4 = 4$	$5 \times 4 - 4 = 16$

	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	$\frac{0-2}{2} = -1$	$\frac{1 \times 5 - (-1)}{2} = 3$	0	$\frac{4 \times 5}{2} = 10$	$\frac{0 - (-2)}{2} = 1$	$\frac{-1 \times 5 - 1}{2} = -3$	0	$\frac{4 \times 5 - 2}{2} = 9$
s_3	0	$\frac{-2 \times 3}{2} = -3$	$\frac{-1 \times 5 - (-1) \times 3}{2} = -1$	0	0	$\frac{-(-2) \times 3}{2} = 3$	$\frac{1 \times 5 - 1 \times 3}{2} = 1$	$\frac{4 \times 5}{2} = 10$	$\frac{16 \times 5 - 2 \times 3}{2} = 37$

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	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	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

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

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

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

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Phase-I:

	z	a_1	a_2	x_1	x_2	x_3	s_1	s_2	s_3	
	1	1	1	0	0	0	0	0	0	0
s_1	0	0	0	1	1	-3	1	0	0	8
a_1	0	1	0	4	-1	1	0	-1	0	2
a_2	0	0	1	2	3	-1	0	0	-1	4

	z	a_1	a_2	x_1	x_2	x_3	s_1	s_2	s_3	
	1	0	0	$-4 - 2 = -6$	$-(-1) - 3 = -2$	$-1 - (-1) = 0$	0	$-(-1) = 1$	$-(-1) = 1$	$-2 - 4 = -6$
s_1	0	0	0	1	1	-3	1	0	0	8
* a_1	0	1	0	4	-1	1	0	-1	0	2
a_2	0	0	1	2	3	-1	0	0	-1	4

	z	a_1	a_2	x_1	x_2	x_3	s_1	s_2	s_3
	$1 \times 2 = 2$	$1 \times 3 = 3$	0	0	$-2 \times 2 + (-1) \times 3 = -7$	$1 \times 3 = 3$	0	$1 \times 2 + (-1) \times 3 = -1$	$1 \times 4 = 4$
s_1	0	-1	0	0	$1 \times 4 - (-1) = 5$	$-3 \times 4 - 1 = -13$	$1 \times 4 = 4$	$-(-1) = 1$	
x_1	0	1	0	4	-1	1	0	-1	
* a_2	0	-1	$1 \times 2 = 2$	0	$3 \times 2 - (-1) = 7$	$-1 \times 2 - 1 = -3$	0	$-(-1) = 1$	$-1 \times 4 = -4$

	z	a_1	a_2	x_1	x_2	x_3	s_1	s_2	s_3
	$\frac{2}{2} = 1$	$\frac{3+(-1)}{2} = 1$	$\frac{2}{2} = 1$	0	0	$\frac{3+(-3)}{2} = 0$	0	$\frac{-1+1}{2} = 0$	$\frac{2+(-2)}{2} = 0$
s_1	0	$\frac{-1 \times 7 - (-1) \times 5}{2} = -1$	$\frac{-2 \times 5}{2} = -5$	0	0	$\frac{-13 \times 7 - (-3) \times 5}{2} = -38$	$\frac{4 \times 7}{2} = 14$	$\frac{1 \times 7 - 1 \times 5}{2} = 1$	$\frac{-(-2) \times 5}{2} = 5$
x_1	0	$\frac{1 \times 7 + (-1)}{2} = 3$	$\frac{2}{2} = 1$	$\frac{4 \times 7}{2} = 14$	0	$\frac{1 \times 7 + (-3)}{2} = 2$	0	$\frac{-1 \times 7 + 1}{2} = -3$	$\frac{-2}{2} = -1$
x_2	0	-1	2	0	7	-3	0	1	-2

Phase-II:

	z	x_1	x_2	x_3	s_1	s_2	s_3	
	1	-2	1	-1	0	0	0	0
s_1	0	0	0	-38	14	1	5	90
x_1	0	14	0	2	0	-3	-1	10
x_2	0	0	7	-3	0	1	-2	6

	z	x_1	x_2	x_3	s_1	s_2	s_3	
	$1 \times 7 = 7$	0	0	$-1 \times 7 + 2 - (-3) = -2$	0	$-3 - 1 = -4$	$-1 - (-2) = 1$	$10 - 6 = 4$
s_1	0	0	0	-38	14	1	5	90
x_1	0	14	0	2	0	-3	-1	10
* x_2	0	0	7	-3	0	1	-2	6

	z	x_1	x_2	x_3	s_1	s_2	s_3	
	$\frac{7}{7} = 1$	0	$\frac{7 \times 4}{7} = 4$	$\frac{-2 + (-3) \times 4}{7} = -2$	0	0	$\frac{1 + (-2) \times 4}{7} = -1$	$\frac{4 + 6 \times 4}{7} = 4$
s_1	0	0	$\frac{-7}{7} = -1$	$\frac{-38 - (-3)}{7} = -5$	$\frac{14}{7} = 2$	0	$\frac{5 - (-2)}{7} = 1$	$\frac{90 - 6}{7} = 12$
x_1	0	$\frac{14}{7} = 2$	$\frac{7 \times 3}{7} = 3$	$\frac{2 + (-3) \times 3}{7} = -1$	0	0	$\frac{-1 + (-2) \times 3}{7} = -1$	$\frac{10 + 6 \times 3}{7} = 4$
s_2	0	0	7	-3	0	1	-2	6

\therefore Unbounded