#1 Minimize $C = 12x + 6y + 3z$

$\Leftrightarrow$

Maximize $P = -12x - 6y - 3z$

$$8x + 2y + 3z - s = 144$$
$$6x + y + 3z + t = 120$$
$$12x + 6y + 3z + P = 0$$

column

	x	y	z	s	t	P	constants	
$144/_{-1} = s$ *	(8)	2	3	-1	0	0	144	$144/8$ ←
$120/_1 = t$	6	1	3	0	1	0	120	$120/6$
	12	6	3	0	0	1	0	

#2

$$x + 3y + 3z + s = 120$$
$$5x + 10y + 5z - t = 300$$
$$4x + 2y + z + u = 90$$
$$-6x - 6y - 3z + P = 0$$

column

	x	y	z	s	t	u	P	constants	
$120/_1 = s$	1	3	3	1	0	0	0	120	$120/3$
$300/_{-1} = t$ *	5	(10)	5	0	-1	0	0	300	$300/10$
$90/_1 = u$	4	2	1	0	0	1	0	90	$90/2$
	-6	-6	-3	0	0	0	1	0	

3. The following tableau is neither an initial tableau nor a final tableau.

column ↓

	x	y	s	t	u	v	p	constants
s	0	1	1	0	0	0	0	12
x	1	1	0	−1	0	0	0	16
* u	0	(3)	0	−5	−1	0	0	12
v	0	(3)	0	−5	0	1	0	12
p	0	−1	0	−5	0	0	1	80

12/1, 16/1, 12/3 ← either → 12/3

3a. Determine the values of x, y, s, t, u, v, and p at this stage.

$x = 16/1$, $y = 0$, $s = 12/1$, $t = 0$, $u = 12/3$, $v = 12/3$, $p = 80/1$

3b. Is this tableau in phase I or phase II? phase I

3c. Determine the pivot.

4. Evaluate $2\begin{bmatrix} 1 & -2 & 4 \\ 3 & 1 & 0 \end{bmatrix} + 3\begin{bmatrix} -2 & 0 \\ 2 & 1 \\ 4 & 0 \end{bmatrix}^T - 4\begin{bmatrix} 7 & -3 & 9 \\ -2 & 4 & 6 \end{bmatrix}$.

5. Compute the product $\begin{bmatrix} 1 & 2 & 3 \\ -4 & 0 & -2 \\ 1 & 1 & 1 \end{bmatrix}\begin{bmatrix} 5 & -2 \\ 1 & 4 \\ 2 & 3 \end{bmatrix}$.

6. Translate the given system of linear equations into matrix form.

$$\begin{aligned} x + 2y - z &= 2 \\ x + y + 2z &= 0 \\ x - y - z &= -1 \end{aligned}.$$

#4 $2\begin{bmatrix} 1 & -2 & 4 \\ 3 & 1 & 0 \end{bmatrix} + 3\begin{bmatrix} -2 & 0 \\ 2 & 1 \\ 4 & 0 \end{bmatrix}^T - 4\begin{bmatrix} 7 & -3 & 9 \\ -2 & 4 & 6 \end{bmatrix}$

$= \begin{bmatrix} 2 & -4 & 8 \\ 6 & 2 & 0 \end{bmatrix} + 3\begin{bmatrix} -2 & 2 & 4 \\ 0 & 1 & 0 \end{bmatrix} - \begin{bmatrix} 28 & -12 & 36 \\ -8 & 16 & 24 \end{bmatrix}$

$= \begin{bmatrix} 2 & -4 & 8 \\ 6 & 2 & 0 \end{bmatrix} + \begin{bmatrix} -6 & 6 & 12 \\ 0 & 3 & 0 \end{bmatrix} - \begin{bmatrix} 28 & -12 & 36 \\ -8 & 16 & 24 \end{bmatrix}$

$= \begin{bmatrix} -32 & 14 & -16 \\ 14 & -11 & -24 \end{bmatrix}$

#5 $\begin{bmatrix} 1 & 2 & 3 \\ -4 & 0 & -2 \\ 1 & 1 & 1 \end{bmatrix}\begin{bmatrix} 5 & -2 \\ 1 & 4 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 13 & 15 \\ -24 & 2 \\ 8 & 5 \end{bmatrix}$

#6 $\begin{bmatrix} 1 & 2 & -1 \\ 1 & 1 & 2 \\ 1 & -1 & -1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix}$

#7

$$\begin{array}{c} \\ R_3-R_4 \end{array}\left[\begin{array}{cccc|cccc} 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \end{array}\right]$$

$$\begin{array}{l} R_1-R_2 \\ R_3+R_2 \end{array}\left[\begin{array}{cccc|cccc} 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & -1 & 0 & 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \end{array}\right]$$

$$\begin{array}{l} R_1+R_3 \\ R_2-R_3 \\ \\ R_4-R_3 \end{array}\left[\begin{array}{cccc|cccc} 1 & 0 & -1 & 1 & 1 & 1 & -1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & -1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 & 0 & 1 \end{array}\right]$$

$$R_1-R_4\left[\begin{array}{cccc|cccc} 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 & -1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & -1 & -1 & 1 \end{array}\right]$$

$$\left[\begin{array}{cccc|cccc} 1 & 0 & 0 & 0 & -1 & 1 & 2 & -1 \\ 0 & 1 & 0 & 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 1 & 0 & -1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & -1 & -1 & 1 \end{array}\right]$$

I $\qquad$ A^{-1}

#8

inverse of coefficient matrix

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 & -1 & -1 \\ -4 & 2 & 1 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

$$= \begin{bmatrix} 2 \\ -1 \\ -2 \end{bmatrix}$$

$x = 2$

$y = -1$

$z = -2$