

(a)

$$\text{maximize: } Z = 30x_1 + 40x_2 + 20x_3 + 10x_4 - 15(800 - x_1) - 20(250 - x_2) \\ - 10(600 - x_3) - 8(500 - x_4)$$

Constraints,

Subject to

$$\left\{ \begin{array}{l} 0.3x_1 + 0.3x_2 + 0.25x_3 + 0.15x_4 \leq 1000 \\ 0.25x_1 + 0.35x_2 + 0.3x_3 + 0.1x_4 \leq 1000 \\ 0.45x_1 + 0.5x_2 + 0.4x_3 + 0.22x_4 \leq 1000 \\ 0.15x_1 + 0.15x_2 + 0.1x_3 + 0.05x_4 \leq 1000 \\ \\ x_1 \leq 800 \\ x_2 \leq 750 \\ x_3 \leq 600 \\ x_4 \leq 500 \\ \\ x_1, x_2, x_3, x_4 \geq 0 \end{array} \right.$$

$$(b) \quad \text{Max} \quad Z = 5x_1 + 4x_2$$

Sub. to.

$$\left\{ \begin{array}{l} -x_1 + x_2 \leq 1 \\ x_2 \leq 2 \\ x_1 + 2x_2 \leq 6 \\ 6x_1 + 4x_2 \leq 24 \\ x_1, x_2 \geq 0 \end{array} \right. \quad \begin{array}{l} -x_1 + x_2 + x_3 = 1 \\ x_2 + x_4 = 2 \\ x_1 + 2x_2 + x_5 = 6 \\ 6x_1 + 4x_2 + x_6 = 24 \end{array}$$

$$A = \begin{bmatrix} -1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 2 & 0 & 0 & 1 & 0 \\ 6 & 4 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 1 \\ 2 \\ 6 \\ 24 \end{bmatrix}$$

$$C_0 = [0 \ 0 \ 0 \ 0]^T$$

$$C = [5 \ 4 \ 0 \ 0 \ 0 \ 0]$$

$$C^T - C_0^T A \quad -C_0^T B$$

Simplex:

	x_1	x_2	x_3	x_4	x_5	x_6	
x_3	-1	1	1	0	0	0	1
x_4	0	1	0	1	0	0	2
x_5	1	2	0	0	1	0	6
x_6	6	4	0	0	0	1	24
	-5	-4	0	0	0	0	0
	↑						

	x_1	x_2	x_3	x_4	x_5	x_6	
x_3	$\cancel{x_0}$	$\cancel{x_3}^5$	1	0	0	$\cancel{\frac{1}{6}}$	$\cancel{x_5}$
x_4	0	1	0	1	0	0	2
x_5	$\cancel{x_0}$	$\cancel{\frac{4}{3}}$	0	0	1	$\cancel{\frac{1}{6}}$	$\cancel{x_2}$
x_1	$\cancel{x_1}$	$\cancel{\frac{2}{3}}$	0	0	0	$\cancel{\frac{1}{6}}$	$\cancel{x_4}$
	$\cancel{-x_0}$	$\cancel{-\frac{2}{3}}$	0	0	0	$\cancel{\frac{5}{6}}$	$\cancel{x_20}$
	\uparrow						

	x_1	x_2	x_3	x_4	x_5	x_6	
x_3	0	$\frac{5}{3}$	1	0	0	$\frac{1}{6}$	5
x_4	0	1	0	1	0	0	2
x_5	$\cancel{x_2}$	0	1	0	0	$\cancel{\frac{3}{4}}$	$\cancel{-\frac{1}{8}}$
x_1	1	$\cancel{\frac{2}{3}}$	0	0	0	$\frac{1}{6}$	$\cancel{3}$
0	0	$\cancel{-\frac{2}{3}}$	0	0	$\cancel{\frac{1}{2}}$	$\cancel{\frac{3}{4}}$	$\cancel{21}$
	\uparrow						

$$x_1 = 3 \quad x_2 = \frac{3}{2} \quad z = 5x_3 + 4x_2 = 21$$