Homework 6

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5.3

$$\text{Max} \quad x_1 + 2x_2 + 5x_3 + 4x_4$$
$$\text{s.t.} \quad x_1 + x_2 + x_3 + x_4 \leq 10$$
$$\bar{x} \geq \bar{0}$$

a)
$$\text{Min.} \quad 10y_1$$
$$\text{s.t.} \quad y_1 \geq 1$$
$$y_1 \geq 2$$
$$y_1 \geq 5$$
$$y_1 \geq 4$$
$$y_1 \geq 0$$

b) $y = [5]$, smallest value of y_1 that satisfies the constraints.

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a) Min. $-500y_1 - 300y_2 + 1500y_3 + 1900y_4 + 1000y_5$

S.t. $-9y_1 - 7y_2 + 5y_3 + 7y_4 + 2y_5 \geq 117$

$-5y_1 - 9y_2 + 3y_3 + 9y_4 + 4y_5 \geq 111$

b) $\bar{y} = (1942, 1600, 143, 0, 457)$

c) R1: \$1942

R2: \$1600

R3: \$143

R4: \$0

R5: \$457

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5.7

a) $2

b) R2: $0
R5: $3

c) 40 units

5.9

5.9

$\bar{X}$ and $\bar{Y}$ are feasible and sat. complem. slackness

$\Rightarrow X^T(C - A^T Y) = 0$ and $Y^T(Ax - b) = 0$

$\Rightarrow X^T C - X^T(A^T Y) = 0$ and $Y^T(Ax) - Y^T b = 0$

$\Rightarrow C^T x = X^T(A^T Y)$ and $(Ax)^T Y = b^T Y$

$\Rightarrow$ " " and $x^T(A^T Y) = b^T Y$

$\Rightarrow C^T x = b^T Y$

$\Rightarrow$ x and y are optimal ✓