

Minimize  $z = 2x_1 + 3x_2 + 4x_3 + 5x_4$

subject to

$$x_1 - x_2 + x_3 - x_4 \geq 10;$$

$$x_1 - 2x_2 + 3x_3 - 4x_4 \geq 6;$$

$$3x_1 - 4x_2 + 5x_3 - 6x_4 \geq 15$$

$$x_1, x_2, x_3, x_4 \geq 0;$$

**MAX Z = -2x1 - x2**

subject to

$$-3x_1 - x_2 \leq -3$$

$$-4x_1 - 3x_2 \leq -6$$

$$-x_1 - 2x_2 \leq -3$$

$$\text{and } x_1, x_2 \geq 0$$

### PROBLEM 1: The Dual Simplex Method

Use the dual simplex method to find the optimal solution to the LP.

(a)

$$\begin{array}{ll} \min & w = 2y_1 + y_2 \\ \text{s.t.} & 5y_1 + y_2 \geq 9 \\ & 2y_1 + 2y_2 \geq 10 \\ & y_j \geq 0 \end{array}$$

(b)

$$\begin{array}{ll} \min & w = 2y_1 + 10y_2 + 8y_3 \\ \text{s.t.} & y_1 + y_2 + y_3 \geq 6 \\ & y_2 + 2y_3 \geq 8 \\ & -y_1 + 2y_2 + 2y_3 \geq 4 \\ & y_j \geq 0 \end{array}$$