

# LINEAR PROGRAMMING (ALGEBRAIC METHOD) I

## STANDARD FORM:

- All constraints are equalities with non-negative RHS
- All variables are non-negative
- Objective function is maximization or minimization

## HANDLING CONSTRAINTS

$$x_1 + 2x_2 \leq 6 \quad \dots \quad x_1 + 2x_2 + s_1 = 6$$

(↑  
+ve slack variable)

$$3x_1 + 2x_2 - 3x_3 \geq 5 \quad \dots \quad 3x_1 + 2x_2 - 3x_3 - s_2 = 5$$

(↑  
+ve surplus variable)

$$3x_1 + 7x_2 - 30x_3 \leq -4$$

$$\dots \quad -3x_1 - 7x_2 + 30x_3 - s_3 = 4$$

## HANDLING VARIABLES

Non-negativity is not a restrictive constraint.

If  $x_2$  is unconstrained in sign then  $x_2$  is replaced by two variables  $x_2', x_2''$ . Where  $x_2'$  and  $x_2''$  are both positive and  $x_2 = x_2' - x_2''$ . Hence a constraint like

$$x_1 + 2x_2 \leq 6 \quad \text{will look like}$$

$$x_1 + 2x_2' - 2x_2'' \leq 6.$$

WRITE THE FOLLOWING IN STANDARD FORM:

Minimize  $Z = 2x_1 + 3x_2$   
 s.t.  
 $x_1 + x_2 = 10$   
 $-2x_1 + 3x_2 \leq -5$   
 $7x_1 - 4x_2 \leq 6$   
 $x_1$  unrestricted  
 $x_2 \geq 0$

Minimize  $Z = 2x_1' - 2x_1'' + 3x_2$   
 s.t.  
 $x_1' - x_1'' + x_2 = 10$   
 $2x_1' - 2x_1'' - 3x_2 - s_2 = 5$   
 $7x_1' - 7x_1'' - 4x_2 + s_3 = 6$   
 $x_1', x_1'', x_2, s_2, s_3 \geq 0$  LP-II