6.B. The Dual Problem
Tuesday, October 31, 2017 8:34 AM Goal: Solve the minimization problem with constraints of the form > Recall: Last time, we solved the maximization problem with constraints of the form < In particular, Maximize P = 5x + 10y Subject to: 8x + 8y \leq 160

4x + 12y \leq 180 Minimize 1 = 16x1 + 9x2 + 21 x3 Subject to: $1x_1 + 1x_2 + 3x_3 > 12$ $2x_1 + 1x_2 + 1x_3 > 16$ $x_1, x_2, x_3 > 0$ Key idea for solving Minimization problem: to translate this to

Key idea for solving Minimization problem: to translate this to the maximization problem with constraints of the form \le and apply the simplex method from last time.

Here are the Steps:

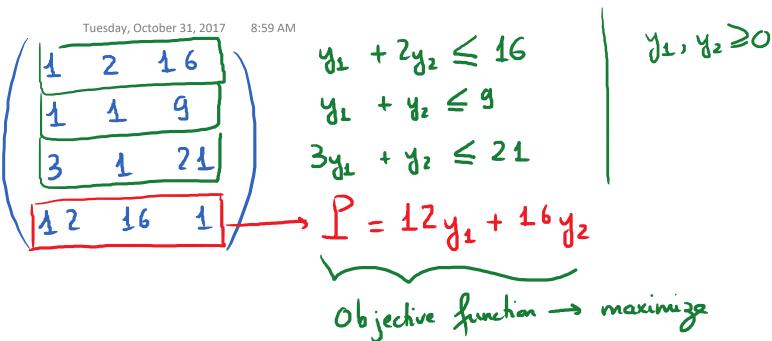
Step 1: Write down the initial matrix for the problem.

(coefficients for objective function will be in bottom 3-by-4 Initial Matrix A = 2 1 1 16

Step 2: Find the transpose of the initial matrix. 4- by-3

Step 3: Use the transpose of the original matrix to rewrite the minimization problem into a maximization problem.

This is called forming the dual problem.



The dual problem is:

Maximize
$$P = 12y_1 + 16y_2$$

Subject to: $y_1 + 2y_2 \le 16$
 $y_1 + y_2 \le 9$
 $3y_1 + y_2 \le 21$
 $y_1, y_2 \ge 0$.

Step 4: Apply the Simplex Method from last time to solve the dual problem.

Note: Introduce Slack Variables. But now we call them $x_1, x_2, x_3, ...$ instead of $\Lambda_1, \Lambda_2, \Lambda_3$ like last time.

* Make a Simplex Tableau.

* Find pivot position

* Do row operation, etc.

So, $x_1 = 4$; $x_2 = 8$; $x_3 = 0$

Minimum cost C = 136