Ali: Prasla

Optimization Methods - HW 2

① - Choose ↳ t = number of tortes eaten

p = number of Pies eaten

- Objective - Maximize

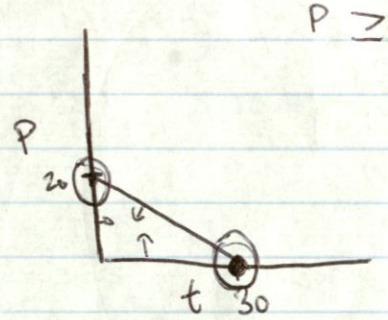
$$4t + 5p$$

- St:

$$2t + 3p \leq 60$$

$$t \geq 0$$

$$p \geq 0$$



$4(0) + 5(20) = 100$

$4(30) + 5(0) = 120$

Max Should eat 30 tortes. for 120 Points

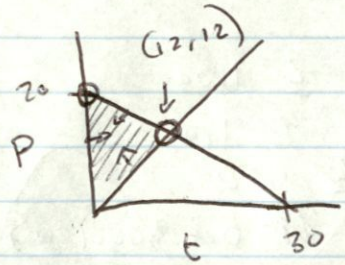
Add Constraint →

$$P \geq t$$

$4t + 5t$

$4(12) + 5(12) = 108$

$4(0) + 5(20) = 100$



$2t + 3p \leq 60$

$P \geq t$

$2t + 3t \leq 60$

$5t \leq 60$

$t \leq 12$

$24 + 3P$

≤ 60

$3P \leq 36$

$P \leq 12$

108 Points by eating 12 Pies and 12 tortes

Reduced by 12 Points

(2) (a) Choose w, c

Objective → max $2000w + 3000c$

sub. ↳ $w + c \leq 450$

$3w + 2c \leq 1000$

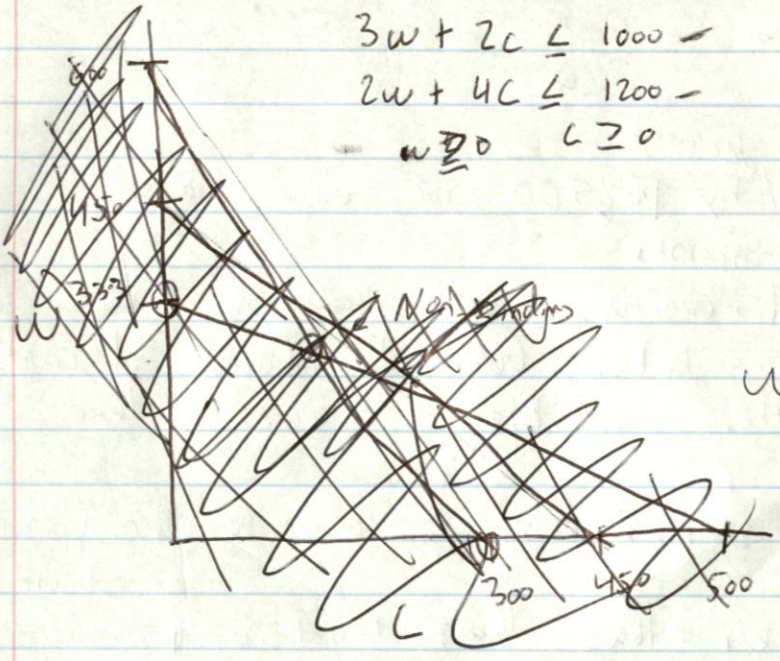
$2w + 4c \leq 1200$

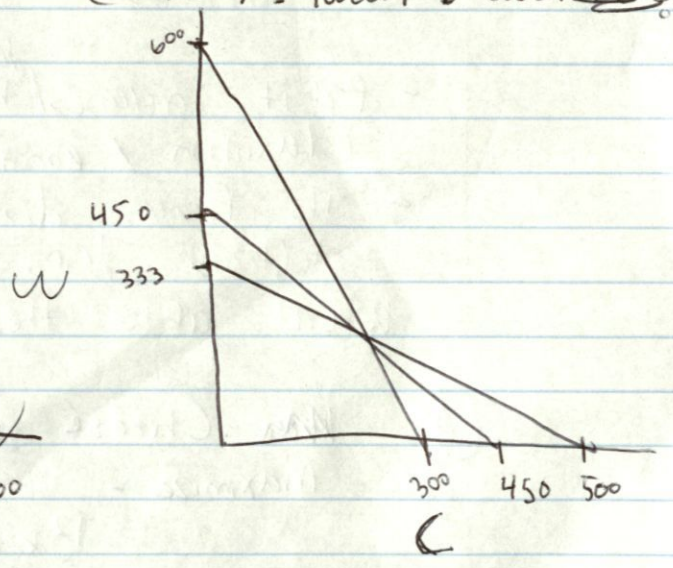
$w \geq 0 \quad c \geq 0$

$(333, 0) = \$666000$

$(0, 300) = \$900,000$

$(200, 900) = 400000 + 600000 = 1000000$ $1 mil





(b) $\max C^T X$

$$X = \begin{pmatrix} w \\ c \end{pmatrix} \qquad C = \begin{pmatrix} 2000 \\ 3000 \end{pmatrix}$$

$$\underset{A}{\begin{pmatrix} 1 & 1 \\ 3 & 2 \\ 2 & 4 \end{pmatrix}} X \leq \underset{b}{\begin{pmatrix} 450 \\ 1000 \\ 1200 \end{pmatrix}}$$

R output = 200,000

↳ $1 mil

R Confirms.

E) duals. from | duals. to

$-\infty$	∞
600	1200
666	1600 ← Fertilizer
$-\infty$	∞
$-\infty$	∞

- Profit increases/decreases by $6,3500 for each 100 ton relaxation / constraints
- The farmer discontinues Corn production after fertilizer drops below 666. The farmer discontinues Wheat after the fertilizer increases to 1600

(3) Choose $x_1, \ldots, x_5$ ← where x = Fraction of investment into

Maximize - $13x_1 + 16x_2 + 16x_3 + 14x_4 + 39x_5$ ← investment i

Subj - ① $11x_1 + 53x_2 + 5x_3 + 5x_4 + 29x_5 \leq 40$

② $3x_1 + 6x_2 + 5x_3 + 2x_4 + 34x_5 \leq 20$

③ $x_1 + \ldots + x_5 \leq 1$

④ $x_1, \ldots, x_5 \geq 0$

R

$$x = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_5 \end{pmatrix} \quad C = \begin{pmatrix} 13 \\ 16 \\ 16 \\ 14 \\ 39 \end{pmatrix}$$

$$A = \begin{pmatrix} 11 & 53 & 5 & 5 & 29 \\ 3 & 6 & 5 & 1 & 34 \\ 1 & 1 & 1 & 1 & 1 \end{pmatrix} x \leq \begin{pmatrix} 40 \\ 20 \\ 1 \end{pmatrix}$$