LP EXERCISES

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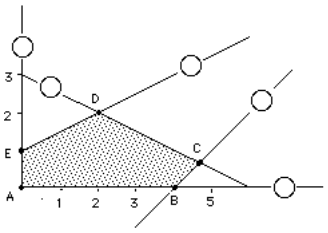
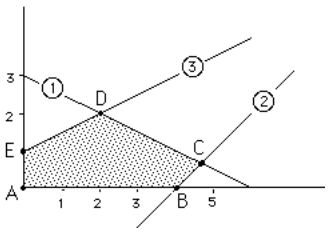
Maximize $3X_1 + 2X_2$
subject to $X_1 + 2X_2 \le 6$ 1
$X_1 - X_2 \le 4$ 2
$-X_1 + 2X_2 \le 2$ 3
$X_1 \ge 0$ 4
$X_2 \ge 0$ 5



Match the 5 constraints with the 5 edges of the feasible region

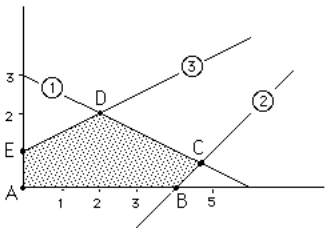
Which variables are basic at each of the extreme points: A, B, C, D, & E?

Max $3X_1 + 2X_2$
s.t.
$X_1 + 2X_2 + X_3 = 6$
$X_1 - X_2 + X_4 = 4$
$-X_1 + 2X_2 + X_5 = 2$
$X_j \ge 0$, j=1,2,..5



How many basic solutions does this LP have? How many are feasible? ... infeasible?

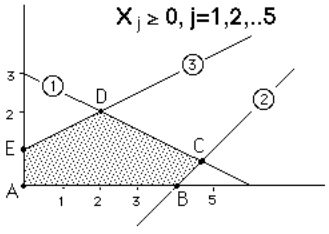
Max $3X_1 + 2X_2$
s.t.
$X_1 + 2X_2 + X_3 = 6$
$X_1 - X_2 + X_4 = 4$
$-X_1 + 2X_2 + X_5 = 2$
$X_j \ge 0$, j=1,2,..5



C is optimal... What can be inferred about the dual optimum, by Complementary Slackness Theorem?

Primal

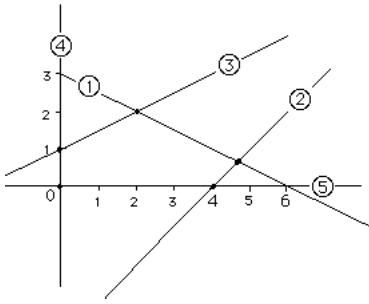
Max $3X_1 + 2X_2$
s.t.
$X_1 + 2X_2 + X_3 = 6$
$X_1 - X_2 + X_4 = 4$
$-X_1 + 2X_2 + X_5 = 2$
$X_j \ge 0$, j=1,2,..5



Min $6Y_1 + 4Y_2 + 2Y_3$
s.t. $Y_1 + Y_2 - Y_3 \ge 3$
$2Y_1 - Y_2 + 2Y_3 \ge 2$
$Y_1 \ge 0, Y_2 \ge 0, Y_3 \ge 0$

Dual

Maximize $3X_1 + 2X_2$
subject to $X_1 + 2X_2 \le 6$ 1
$X_1 - X_2 \ge 4$ 2
$-X_1 + 2X_2 \le 2$ 3
$X_1 \ge 0$ 4
X_2 urs 5



Where is the feasible region?

Write the dual LP problem

Maximize $3X_1 + 2X_2$
subject to $X_1 + 2X_2 \le 6$
$X_1 - X_2 \ge 4$
$-X_1 + 2X_2 \le 2$
$X_1 \ge 0$
X_2 urs

Minimize $6Y_1 + 4Y_2 + 2Y_3$
s.t. $Y_1 + Y_2 - Y_3 \square 3$
$2Y_1 - Y_2 + 2Y_3 \square 2$
$Y_1 \square 0, Y_2 \square 0, Y_3 \square 0$

Write the dual LP problem

Maximize $3X_1 + 2X_2$
subject to $X_1 + 2X_2 = 6$
$X_1 - X_2 \ge 4$
$-X_1 + 2X_2 \le 2$
$X_1 \le 0$
$X_2 \ge 0$

Minimize $6Y_1 + 4Y_2 + 2Y_3$
s.t. $Y_1 + Y_2 - Y_3 \square 3$
$2Y_1 - Y_2 + 2Y_3 \square 2$
$Y_1 \square 0, Y_2 \square 0, Y_3 \square 0$