3. x_1 = Number of hours of Process 1 and x_2 = Number of hours of Process 2. Then the appropriate LP is

min $z = 4x_1 + x_2$

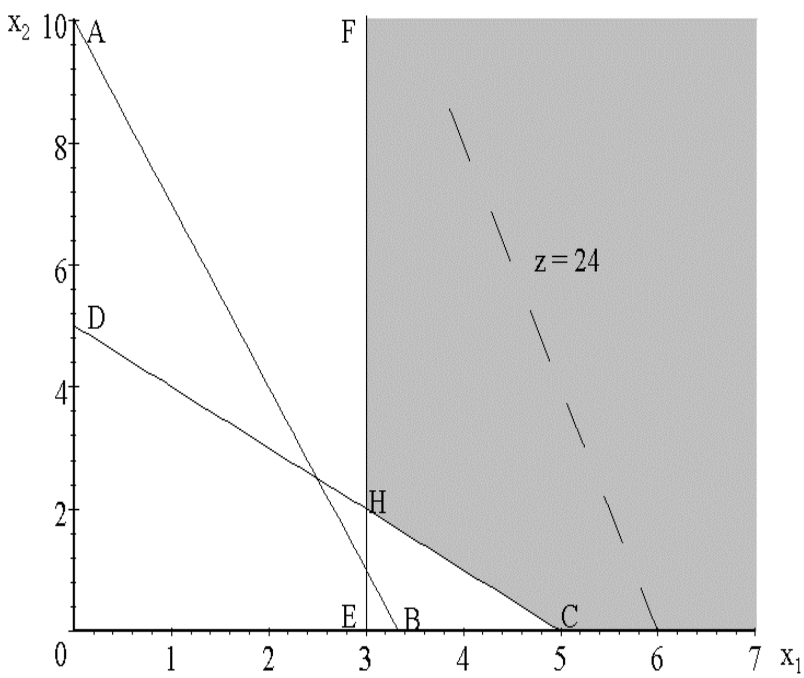
s.t. $3x_1 + x_2 \geq 10$ (A constraint)

$x_1 + x_2 \geq 5$ (B constraint)

$x_1 \geq 3$ (C constraint)

$x_1\ x_2 \geq 0$

AB is $3x_1 + x_2 = 10$. CD is $x_1 + x_2 = 5$. EF is $x_1 = 3$. The feasible region is shaded. Dotted line is isocost line $4x_1 + x_2 = 24$. Moving isocost line down to left we see that H (where B and C constraints intersect) is optimal. Thus optimal solution to LP is $x_1 = 3$, $x_2 = 2$, $z = 4(3) + 2 = \$14$.



5. Let x_1 = desks produced, x_2 = chairs produced. LP formulation is

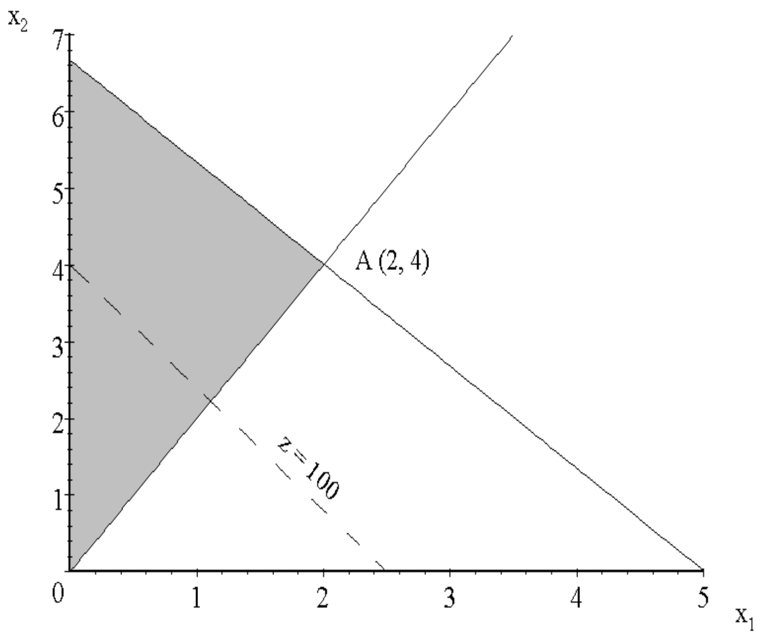
max $z = 40x_1 + 25x_2$

s.t. $-2x_1 + x_2 \geq 0$

$4x_1 + 3x_2 \leq 20$

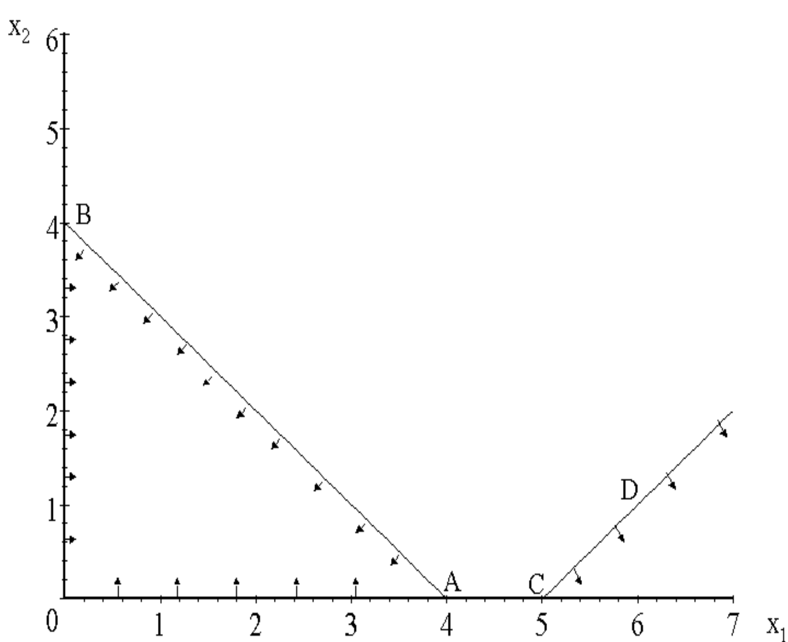
$x_1, x_2 \geq 0$

Graphically we find the optimal solution to be $x_1 = 2$, $x_2 = 4$ and $z = 180$.

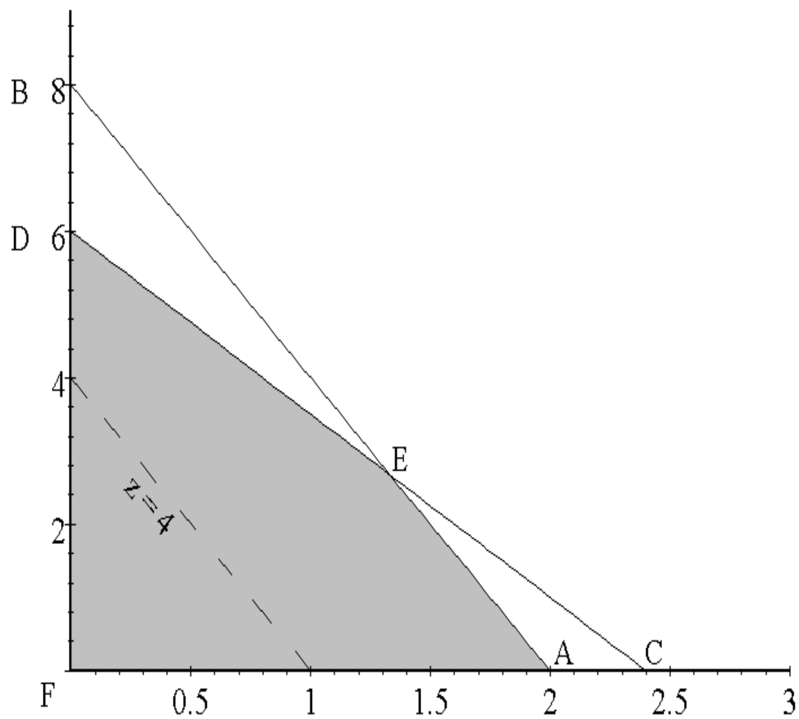


Section 3.3

1. AB is $x_1 + x_2 = 4$. CD is $x_1 - x_2 = 5$. From graph we see that there is no feasible solution (Case 3).

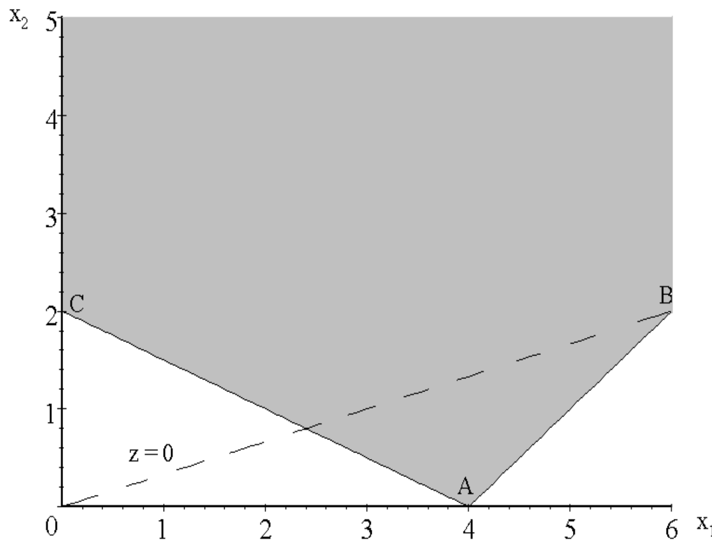


2. AB is $8x_1 + 2x_2 = 16$. CD is $5x_1 + 2x_2 = 12$. Dotted line



is $z = 4x_1 + x_2 = 4$. Feasible region is bounded by AEDF. Since isoprofit line is parallel to AE, entire line segment AE is optimal. Thus we have alternative or multiple optimal solutions.

3. AB is $x_1 - x_2 = 4$. AC is $x_1 + 2x_2 = 4$. Feasible region is bounded by AC and infinite line segment AB. Dotted line is isoprofit line $z = 0$. To increase z we move parallel to isoprofit line in an upward and `leftward' direction. We will never entirely lose contact with the feasible region, so we have an unbounded LP (Case 4).



4. AB is $2x_1 + x_2 = 6$. CD is $x_1 + 3x_2 = 9$. The feasible region is bounded by AECF. Dotted line is $3 = 3x_1 + x_2$. Moving up and to right (and parallel to isoprofit line) we find that point A is optimal. A is where constraints $2x_1 + x_2 \leq 6$ and $x_2 \geq 0$ are binding.
Thus E has $2x_1 + x_2 = 6$ and $x_2 = 0$. Optimal solution to the LP is $x_1 = 3$, $x_2 = 0$, $z = 9$.