

**Math 323 Homework 5: Due Friday, November 6**

Assignment 5: Problems 7-16d, 7-17b, 7-24 a-g,i,j,k,m,o; 9-4 and the problem below.

1. The owner of a shop producing automobile trailers wishes to determine the best mix for his three products: flat-bed trailers, economy trailers, and luxury trailers. His shop is limited to working 24 days/month on metalworking and 60 days/month on woodworking for these products. Let  $x_1$  denote the number flat-bed trailers produced per month,  $x_2$  denote the number economy trailers produced per month, and  $x_3$  denote the number luxury trailers produced per month. Assuming that the costs for metalworking and woodworking capacity are fixed, the problem becomes:

$$\begin{aligned} & \text{Maximize } 6x_1 + 14x_2 + 13x_3 \\ & \text{subject to } 1/2x_1 + 2x_2 + x_3 \leq 24 \\ & \quad \quad \quad x_1 + 2x_2 + 4x_3 \leq 60 \\ & \quad \quad \quad x_1, x_2, x_3 \geq 0 \end{aligned}$$

Suppose that, by reallocating floor space and manpower in the workshop, we can exchange any number of days of woodworking capacity for the same number of days of metalworking capacity. After such an exchange, the capacities will become  $(24 + \theta)$  days/month for metalworking capacity and  $(60 - \theta)$  days/month for woodworking capacity. Analyze the impact of  $\theta$  on the optimal value of the above linear program for  $\theta \in \mathfrak{R}$ . What is the optimal value of  $\theta$ .