Applications of Systems of Linear Inequalities

Finite Math

26 April 2017

Quiz

What does it mean for a feasible region to be bounded?

Applications

Example

A manufacturing plant makes two types of inflatable boats–a two-person boat and a four-person boat. Each two-person boat requires 0.9 *labor-hour in the cutting department and* 0.8 *labor-hour in the assembly department. Each four-person boat requires* 1.8 *labor-hours in the cutting department and* 1.2 *labor-hours in the assembly department. The maximum labor-hours available each month in the cutting and assembly departments are* 864 *and* 672*, respectively.*

(a) *Summarize this information in a table.*

(b) *If x two-person boats and y four-person boats are manufactured each month, write a system of linear inequalities that reflects the conditions indicated. Graph the feasible region.*

Now You Try It!

Example

A manufacturing company makes two types of water skis, a trick ski and a slalom ski. The trick ski requires 6 *labor-hours for fabricating and* 1 *labor-hour for finishing. The trick slalom requires* 4 *labor-hours for fabricating and* 1 *labor-hour for finishing. The maximum labor-hours available per day for fabricating and finishing are* 108 *and* 24*, respectively. If* x *is the number of trick skis and* y *is the number of slalom skis produced per day, write a system of linear inequalities that indicates appropriate restraints on* x *and* y*. Find the set of feasible solutions graphically for the number of each type of ski that can be produced.*

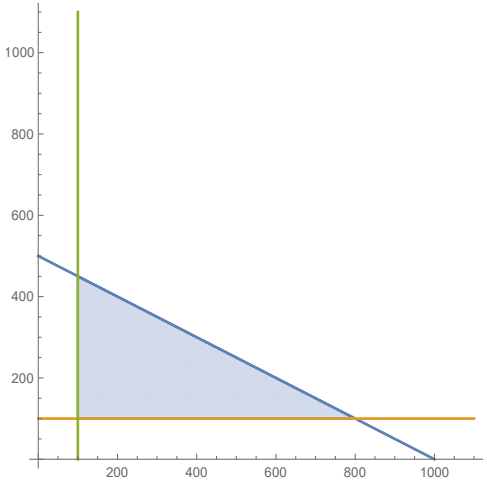
A Simple Linear Programming Problem

Example

A food vendor at a rock concert sells hot dogs for \$4 *each and hamburgers for* \$5 *each. She purchases hot dogs for* 50¢ *each and hamburgers for* \$1 *each. If she has* \$500 *to spend on supplies, and wants to bring at least* 100 *each of hot dogs and hamburgers, how many hot dogs and hamburgers should she buy to make the most money at the concert? (Assume she sells her entire inventory.) What is her maximum revenue?*

Solution

The feasible region of the problem is

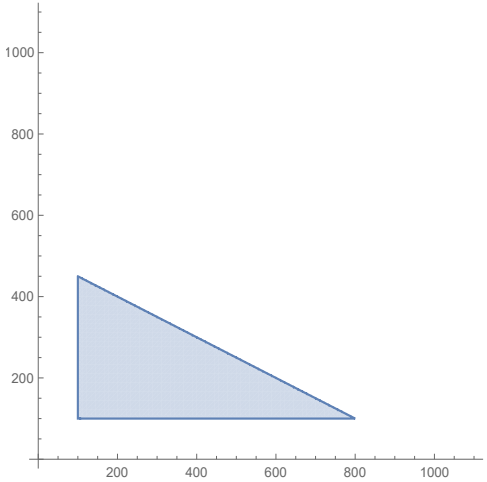


Solution

To figure out if she can make R_0 dollars in sales, we graph the line $4x + 5y = R_0$ and see if it hits the feasible region. If it does, it is possible to make that much in sales.

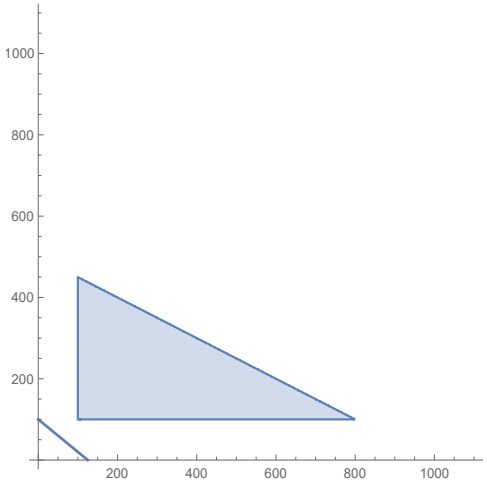
Solution

Here is the solution region again:



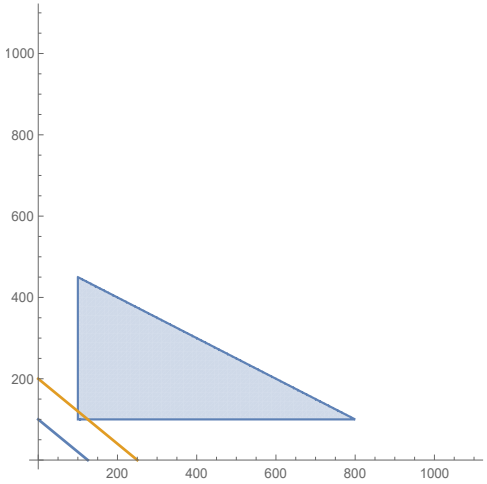
Solution

Add the revenue line for $R_0 = 500$.



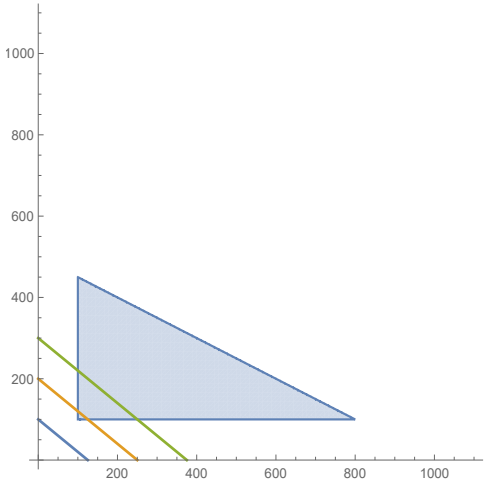
Solution

Add the revenue line for $R_0 = 1000$.



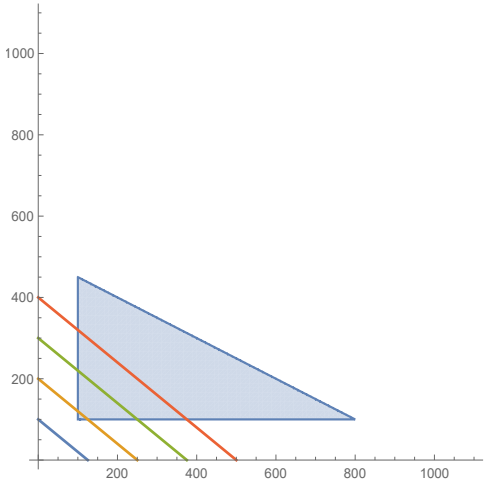
Solution

Add the revenue line for $R_0 = 1500$.



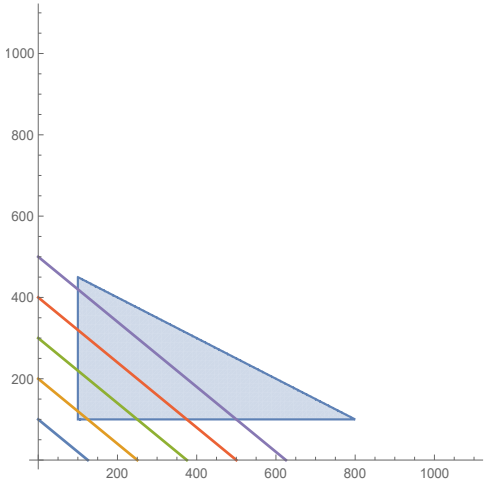
Solution

Add the revenue line for $R_0 = 2000$.



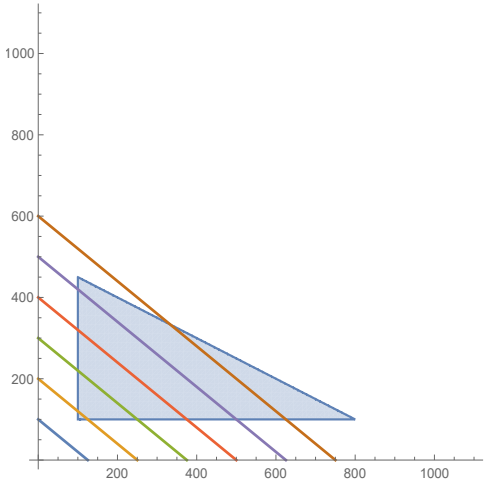
Solution

Add the revenue line for $R_0 = 2500$.



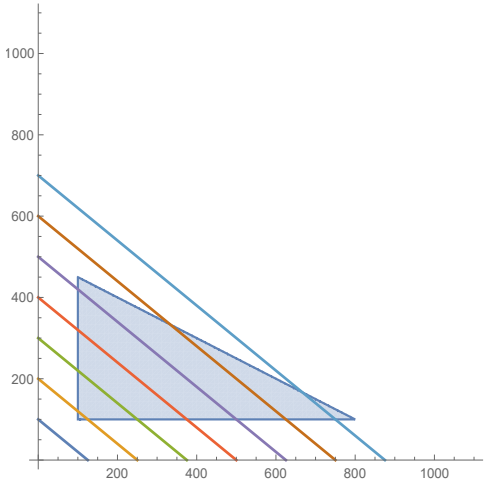
Solution

Add the revenue line for $R_0 = 3000$.



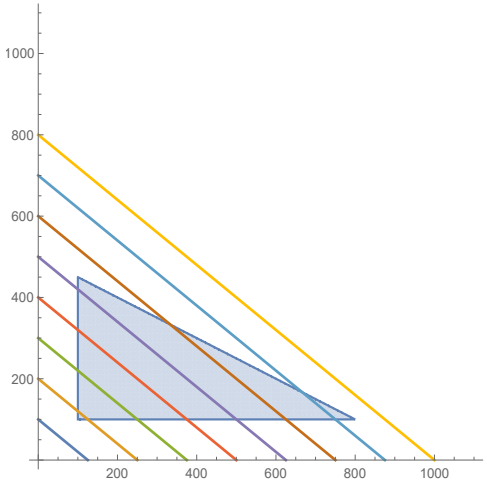
Solution

Add the revenue line for $R_0 = 3500$.



Solution

Add the revenue line for $R_0 = 4000$.



Solution

The line for max revenue is with $R_0 = 3700$.