Do the algebra required to find a simultaneous solutions to these two equations (from last class):

$$3x_1 + x_2 = 3$$
$$x_1 + 3x_2 = 5$$

Linear function:

given real numbers $c_0, c_1, c_2, \ldots, c_n$,

$f(x_1, x_2, \ldots , x_n) = c_0 + c_1 x_1 + c_2 x_2 + \ldots + c_n x_n$.

Linear equation: $f(x_1, x_2, \ldots , x_n) = b$.

Linear inequalities:

$f(x_1, x_2, \ldots , x_n) \leq b$, or

$f(x_1, x_2, \ldots , x_n) \geq b$.

Linear constraints: linear equations and linear inequalities.

Linear programming problem: optimizing (minimizing or maximizing) a linear functions subject to linear constraints.

Standard form (chapters 1-7):

Maximize $c^T x$

subject to

$Ax \leq b$

and $b \geq 0$

The Diet Problem:

Find the cheapest diet satisfying certain nutritional requirements using certain foods.

m= number of nutrients,

n= number of foods,

b_i, i=1, 2, ..., m = amount of ith nutrient required,

c_j, j=1, 2, ..., n = cost per unit of jth food,

a_{ij} = number of units of ith nutrient in jth food,

x_j, j=1, 2, ..., n = units of jth food in diet.

The cost of the diet (**objective function**):

$c_1 x_1 + c_2 x_2 + c_3 x_3 + ... + c_n x_n$.

Minimize the cost of the diet:

$c_1 x_1 + c_2 x_2 + c_3 x_3 + ... + c_n x_n$.

To ensure there is an adequate quantity of the ith nutrient, i=1, 2, ..., m (**linear constraints**):

$a_{ij} x_j \geq b_i$, i= 1, 2, ...,m

To ensure number of units chosen make sense (**non-negativity constraints**):

$x_j \geq 0$, j=1, 2, ..., n.

We also might have limits on certain foods or beverages.

For example:

Suppose

x_2 = number of beers

x_3 = number of glasses of wine

To ensure there are at most 2.5 servings of alcohol in the diet:

$x_2 + x_3 \ + \leq 2.5$ (also a linear constraint).

I've found out the reason you cannot get channel 27.
This is your microwave, not your television.

Product Mix Problem

A manufacturing company produces two models of industrial microwave ovens: X and the Y.

Components for both the products need to machined then assembled.

It takes 4 hours to machine the components for X and 3 hours to machine the components for Y.

A total of 100 machine hours are available per day.

It takes 2 hours to assemble X and 3 hours to assemble Y. There are 48 hours of assembly time available per day.

The market potential for X is 15 per day.
The market potential for Y is 20 per day.

The marketing department wants the company to produce at least 10 products per day, in any combination.

Each X contributes $2000 to profit and each Y contributes $2500 to profit.

How many X and Y products should be produced per day to maximize profit?