

Optimization Assignment-1

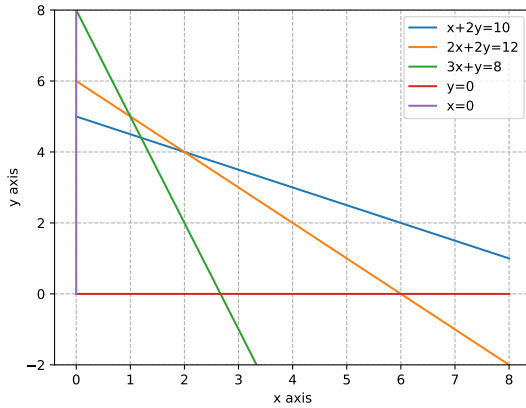
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Problem: A dietician wishes to mix together two kinds of food X and Y in such away that the mixture contains atleast 10 units of vitamin A ,12 units of vitamin B and 8 units of vitamin C .The vitamin contents of one kg food is given below:

Food	Vitamin A	Vitamin B	Vitamin C
X	1	2	3
Y	2	2	1

One kg of food X costs Rs 16 and one kg of food Y costs Rs 20. Find the least cost of the mixture which will produce the required diet?



Solution

Let mixture contains x units of food X,y units of food Y.

2

According to given problem, problem can be formulated as,

$$P = \min(16x + 20y) \quad (1)$$

where P is minimum cost of mixture.
for Vitamin A

$$x + 2y \geq 10 \quad (2)$$

for Vitamin B

$$2x + 2y \geq 12 \quad (3)$$

for Vitamin C

$$3x + y \geq 8 \quad (4)$$

mixture contains both X,Y so,

$$x \geq 0, y \geq 0 \quad (5)$$

eq 1 and 2 to 5 can be expressed in vector form as

$$\mathbf{P} = \min \begin{pmatrix} 16 & 20 \end{pmatrix} \mathbf{x}$$

$$\begin{pmatrix} 1 & 2 \\ 2 & 2 \\ 3 & 1 \\ 1 & 0 \\ 0 & 1 \end{pmatrix} \mathbf{x} \geq \begin{pmatrix} 10 \\ 12 \\ 8 \\ 0 \\ 0 \end{pmatrix}$$

Solving above equations using cvxpy, we get

$$P_{\min} = 120$$

$$\mathbf{x} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$