Exercises -1-

1.1) A diet conscious housewife wishes to ensure certain minimum intake of vitamins A, B and C for the family. The minimum daily (quantity) needs of vitamins A,B and C for the family are respectively 30, 20 and 16 for the supply of theses minimum vitamin requirements, the house wife relies on two fresh foods. The first one provides 2, 4, 8 units of the three vitamins per gram of the foodstuff respectively. The first foodstuff costs 3$ per gram and the second 2$ per gram. The problem is how many grams of each foodstuff should the housewife buy every day to keep her food bills as low as possible.

1.2) The manager of an oil refinery has to decide upon the optimal mix of two possible blending processes of which the inputs and outputs per production run are as follows

Process	input		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amount available of crude A and B are 200 units and 150 units respectively. Market requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. The profits per production run from process 1 and process 2 are 3$ and 4$ respectively. Formulate the problem as liner programming problem.

1.3) A workshop has three (3) types of machines A, B and C; it can manufacture two (2) products 1 and 2, and all products have to go to each machine and each one goes in the same order; First to the machine A, then to B and then to C. The following table shows:

- The hours needed at each machine, per product unit
- The total available hours for each machine, per week
- The profit of each product per unit sold

Type of Machine	Product 1	Product 2	Available hours per week
A	2	2	16
B	1	2	12
C	4	2	28
Profit per unit	1	1.50	

Formulate and solve using the graphical method a Linear Programming model for the previous situation that allows the workshop to obtain maximum gains

1.4) A company produces two different products. One of them needs 1/4 of an hour of assembly work per unit, 1/8 of an hour in quality control work and US$1.2 in raw materials. The other product requires 1/3 of an hour of assembly work per unit, 1/3 of an hour in quality control work and US$0.9 in raw materials. Given the current availability of staff in the company, each day there is at most a total of 90 hours available for assembly and 80 hours for quality control. The first and second products described have a market value (sale price) of US$8.0 and $9.0 per unit respectively. In addition, the maximum amount of daily sales for the first product is estimated to be 200 units, without there being a maximum limit of daily sales for the second product.
Formulate and solve graphically a Linear Programming model that will allow the company to maximize profits