MAST30013 – Techniques in Operations Research

Semester 1, 2021

Tutorial 7

1. Suppose a company produces two products: A and B, and the cost of producing one unit of Product A and Product B are $10 and $20, respectively. The total revenue of the company is given by

$$R(x, y) = 5xy$$

where x is the number of units of Product A and y is the number of units of Product B.

   (a) Use the method of Lagrangian multipliers to find the maximum revenue the company can generate if it has a budget of $1,000.

   (b) Use the economic interpretation of Lagrangian multipliers to approximate the increase in revenue if company increases its budget to $1,100.

2. A firm that uses two inputs to produce output has the production function $3x^{1/3}y^{1/3}$, where x is the amount of input 1 and y is the amount of input 2. The price of output is 1 and the prices of the inputs are w and v. The firm is constrained by the government to use exactly 1000 units of input 1.

   How much of input 2 does it use if the firm wants to maximize its profit?

   What is the most that it is willing to pay in order to obtain authorization to use another ϵ units of input 1?