Assignment 11 (Due on the week November 30 – December 5)

1. Train services on a railway branch line cost $ 1600 per month to operate. Passengers consist of the two cohorts: business passengers with the aggregated demand $Q_d = 2000 - 10P$, where Q_d is the number of journeys made per month and P is the price in cents charged for each journey and the retired holidaymakers with demand $Q_d = 4000 - 40P$. How much should the railway authority charge if:

   (a) the same price is charged for everyone?

   (b) prices for the cohorts are different?

   What price variant will the company choose?

2. Assume that $U = (x+2)(y+1)$, and we assign no specific numerical values to the positive price and income parameters in the budget constraint $p_x x + p_y y = I$.

   (a) Write down the Lagrangian function.

   (b) Find the optimal values of the choice variables and the Lagrange multiplier in terms of the price and income parameters, assuming that the optimal bundle includes both goods in positive quantities.

   (c) Check the second-order sufficient condition for maximum.

   Find points of local extrema and classify them

3. $u = x_1^2 + x_2^2$, if $x_1^2 + x_2 = 1$,

4. $z = 2x^4 + y^4 - x^2 - 2y^2$,

5. $z = xy + \dfrac{50}{x} + \dfrac{20}{y}$, subject to $x > 0$, $y > 0$.