

620-361 Operations Research Techniques and Algorithms

Practice Class 4

You are playing cards with your friends when you notice that the floor of the room is slanted. The slant is sufficient to provide additional viewing of your friends cards according to the function $x_1 + x_2$. Although you can see the *optimum cheating position* and the *optimum honesty position* at the round table with radius $\sqrt{2}$, you decide that this is an easy example to practice the Lagrangian method you have been learning about in your numerical analysis course. You opt to seek the optimum honesty position.

1. Formally write down the model of the problem with one constraint, c_1 .
2. Sketch the feasible region and indicate the optimal value.
3. Express the Lagrangian of the problem and solve (the long way) to find x_1^* , x_2^* and η^* for the optimum honesty position.
4. You realise there are two optimums. Calculate the Hessian of the Lagrangian to demonstrate which optimal value is a maximum or minimum.
5. Interpret the Lagrange multipliers¹.
6. On your diagram, draw direction vectors for ∇f and ∇c_1 at both the minimum and the maximum.

¹Sometimes Lagrange multipliers have an interesting physical interpretation - we will investigate this more in the next week.