ECO 102: Topics in Economics
Ecole Polytechnique, Spring 2022
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TD 1 (part 2): Maximisation and the social multiplier

In this TD we will a review maximisation technique (the Lagrangian method) and apply it in the context of the social multiplier effect.

Exercise

1. Review the Lagrangian method to solve for constrained optimization problems (we will see this together in class).

2. Apply the Lagrangian method to solve for the following problem:

   Maximize $f = x^{1/2}y^{1/2}$ subject to $ax + cy = b$

   Obtain first order conditions, x^*, y^* and λ^*

3. Apply the Lagrangian method to the social multiplier effect seen in class (slide 11 of lecture 1). Show that:

   (a) $U_x = pU_y$
   (b) $\frac{dX}{dS} > 0 \Leftrightarrow U_{xs} > pU_{ys}$

4. (Extra) Interpret the lagrange multiplier λ in the general case seen in question 1.

5. (Extra) Derive second-order conditions for constrained maximisation in the general case seen in question 1.