Resource Economics
Final Exam – Fall 2021

Problems 1 and 2 are brief discussions that you can type into INSPERA. If you are concise, half a page is enough. Please try not to exceed one page. Problem 3 requires calculations and can be answered on paper. It is your responsibility that the submitted document/photo/scan is legible.

1. Resource Taxation, 25%.
How does taxation of a resource or the resource extracting sector affect extraction? Write a brief verbal essay. Distinguish three different types of taxes and comment on the royalty.

2. Non-Convex Ecosystem Dynamics, 25%.
Explain the concept of a Skiba point in a non-convex resource management problem. No equations required. What differs in the underlying dynamic system as opposed to our "usual" dynamic system (not containing a Skiba point)? What are the implications for the solution set?

3. Extraction of Gold, 50%.
A social planner wants to build an optimal extraction model for gold. You are asked to help with this task. Extraction costs $C(q_t, R_t)$ depend on the extraction flow (q_t) of the resource as well as the remaining stock in the ground (R_t).

  i) Set up the continuous time infinite horizon optimization model including objective and equation of motion. Think carefully about the objective and discuss your modeling choice. How does it differ from the case of oil?

 ii) Set up the current value Hamiltonian and derive the necessary conditions for an optimal extraction path. Do not worry about the transversality conditions.

iii) Derive the Euler equation and discuss the sign of the different terms.

 iv) Interpret the Euler equation.

  v) How and why does the Euler equation differ from a similar model describing oil extraction?