

**ECON 4113. OPTIONAL HOMEWORK PART 2. DUE MAY 2.**

Solve the following problems by all means necessary. If you use Lagrange Theorem do the Constraint Qualification properly. There is no need to check second order conditions. Hint: graph the functions, this helps a lot.

1. For each value of the parameter  $q \in [-1, 1]$  solve the following problem

$$\begin{aligned} \max_{p \in \mathbb{R}} \quad & qp^2 - p \\ \text{s.t.} \quad & 0 \leq p \leq 1 \end{aligned}$$

- 2.

$$\begin{aligned} \max_{x, y \in \mathbb{R}} \quad & -x^2 - 2y^2 - xy - 2x \\ \text{s.t.} \quad & x^2 + y^2 \leq 4 \\ & x + y \leq 2 \\ & x, y \geq -2 \end{aligned}$$

- 3.

$$\begin{aligned} \max_{x, y \in \mathbb{R}} \quad & e^{-(x+y)} \sin x \\ \text{s.t.} \quad & y = |x| \end{aligned}$$

4. Dixit, Problem 3.2

- 5.

$$\begin{aligned} \max_{x, y \in \mathbb{R}} \quad & x \\ \text{s.t.} \quad & x^3 + y^2 = 0 \end{aligned}$$