Microeconomics HW2

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Due on May 1st.

1. Solve the following optimization problems. You should carefully explain your logic as possible as you can.

1. $\min x^2$.

2. $\min x^4 - x^3 - 2x^2$.

3. $\min x^2 + y^2$ s.t. $x + y = -2$.

4. $\max \alpha \log x + (1 - \alpha) \log y$ s.t. $p_x x + p_y y \leq I$, $x \geq 0$, $y \geq 0$ where $\alpha \in (0, 1)$.

5. $\max ax + by$ s.t. $p_x x + p_y y \leq I$, $x \geq 0$, $y \geq 0$ where $a > 0, b > 0$.

6. $\max \min\{x, y\}$ s.t. $2x + 3y \leq 5$ $x \geq 0$, $y \geq 0$.

2. Consider the following problem,

$$\max y - (x - 1/2)^2 \quad s.t. \quad (x - 1)^3 = (y - 1)^3. \tag{1}$$

Find the optimal solution **without using the Lagrange method**. After that, try to solve the problem using the Lagrange method and show that it does not work. Finally, explain why the Lagrange method does not work in this context.