

Problem Set 4

ECON 5153

For full credit you must show all your work.

1. Determine the definiteness of the following symmetric matrices:

$$a) \begin{pmatrix} 1 & 4 \\ 4 & 2 \end{pmatrix}, \quad b) \begin{pmatrix} 1 & -1 & 0 \\ -1 & 1 & 0 \\ 0 & 0 & 2 \end{pmatrix}$$

2. Determine the definiteness of the following quadratic forms on their respective constraints:

a) $Q(x_1, x_2) = x_1^2 - 2x_1x_2 - 4x_2^2$, subject to $x_1 + 2x_2 = 0$;

b) $Q(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2 + 2x_1x_3 - 2x_2x_3$, subject to $x_1 + x_2 + x_3 = 0$ and $x_1 - 2x_2 + x_3 = 0$.

3. Exercise 17.1 on page 402 (Simon and Blume).

4. A firm uses two inputs to produce a single output. The production function is given as

$$f(L, K) = 4L^{1/4}K^{1/4}.$$

Suppose that p is the price of the output, w is the wage rate, and r is the unit cost of capital. Find the maximum profit and the corresponding optimal input bundle.