

## Assignment 2

Due date: Thursday, 25th novembre

Please submit your own assignment

### 2.1

A perfectly competitive firm's output  $Q$  is determined by

$$Q = z_1^{\alpha_1} z_2^{\alpha_2} \dots z_m^{\alpha_m}$$

where  $z_i$  is its usage of input  $i$  and  $\alpha_i \geq 0$  is a parameter  $i = 1, 2, \dots, m$ , such that  $\sum_{j=1}^m \alpha_j > 0$ .

1. Find the long-run marginal cost and conditional input demand functions for this firm. Under what conditions will marginal cost rise with output?
2. Assume that in the short run only  $k$  of the inputs are variable. Find the short-run marginal cost and conditional input demand functions.
3. Find the firm's short-run elasticity of supply and its short-run (own-price) elasticity of conditional demand for input  $i$ . Show that the smaller is  $k$ , the smaller (in absolute terms) are these elasticities.

### 2.2

A firm has a fixed cost  $F$  and marginal costs

$$c = a + bQ$$

where  $Q$  is output. If the firm were a price-taker, what is the lowest price at which it would be prepared to produce a positive amount of output? If the competitive price were above this level, find the amount of output  $Q^*$  that the firm would produce.

If the firm is actually a monopolist and the inverse demand function is

$$P = A - \frac{1}{2}BQ$$

(where  $A > a$  and  $B > 0$ ) find the expression for the firm's marginal revenue in terms of output. Illustrate the optimum in a diagram and show that the firm will produce

$$Q^{**} := \frac{A - a}{b + B}$$

What is the price charged  $P^{**}$  and the marginal cost  $c^{**}$  at this output level? Compare  $Q^{**}$  and  $Q^*$ .

The government decides to regulate the monopoly. The regulator has the power to control the price by setting a ceiling  $P_{max}$ . Plot the average and marginal revenue curves that would then face the monopolist. Use these to show:

1. If  $P_{max} > P^{**}$  the firm's output and price remain unchanged at  $Q^{**}$  and  $P^{**}$
2. If  $P_{max} < c^{**}$  the firm's output will fall below  $Q^{**}$ .
3. Otherwise output will rise above  $Q^{**}$ .