

ECON10071

Exercise Class: Problem Sheet 1

Logic & Functions

1. A simple example of a model of a profit maximizing firm is given below. Measuring quantity of output, q , along the horizontal axis and price, cost, revenue and profit on the vertical axis, sketch the graphs of these functions and comment on their main features (these are functions of q). Would *you* say they have an economically acceptable shape?

$$\text{Demand Price } p(q) = 10.0 - 2.0q$$

$$\text{Revenue } R(q) = p(q) \times q = (10.0 - 2.0q)q$$

$$\text{Cost } C(q) = 5q + 1$$

$$\text{Profit } \Pi(q) = R(q) - C(q)$$

Sketch the average cost curve; i.e., the graph of the function $AC(q) \equiv C(q)/q = 5 + 1/q$.

2. Consider the quadratic $f(x) = x^2 + px + q$, where p and q are parameters (i.e., some arbitrary constants/numbers). Show that the roots of $f(x) = 0$ add up to $-p$ and their product is q , whatever the values of p and q .
3. Consider the function $f(x) = \exp(-ax)$ and $g(x) = c + dx$, where a , c and d are parameters.
 - (a) Does $f(x) = g(x)$ necessarily have a solution (for x)?
 - (b) If $f(x) = g(x)$ does have a solution, is it necessarily unique?
 - (c) Can you specify a sufficient condition (but perhaps not necessary), in terms of either a , c and/or d , which will ensure that $f(x) = g(x)$ has a unique solution?