

Microeconomics

Fall 2011

Class #1: Production Technology

David Henriques

Classes: 40, 41

Question 1

Consider the production function $Q = TL^2$ where Q is output of pins, T is the number of tools used in the production process and L denotes the number of workers.

- Suppose that in the short-run the number of tools is fixed in $T = 1$. Compute the total product, the average product by worker and the marginal productivity of labor for $L = 1$ and $L = 5$.
- Draw the total production curve. Then graph the average product and the marginal productivity of labor derived from the total production curve.
- In the long-run both inputs are variable. Does the pin production function given above exhibit increasing, decreasing or constant returns to scale? Describe what “returns to scale” means intuitively. Is Q monotonic in T and L ?
- Compute the expressions of the isoquants for 100 and 1000 pins. Interpret economically the shape of the isoquants.
- Compute the $MRTS_{L,T}$.

Question 2

The production function of food in an island is $Q = K\sqrt{L}$ where L denotes the number of people (labor), K equals land (capital) and Q equals total quantity of food produced.

- Assume that the average quantity of food required by each worker to subsist is 0.5, and that the size of the island is forever fixed to be 1. Calculate for each level of labor: the total product, the marginal product and the average product.

Labor	Total Product	Average Product	Marginal Product
1			
2			
3			
4			
5			

- How many workers will there be at the subsistence level?
- Graph the total product curve, the average and marginal product of labor curves assuming that labor is variable but land is fixed in the short-run.
- How would the previous graphs change if a second island of the same size was discovered and became available to the inhabitants of the original island.

Question 3

Characterize the following production functions regarding returns to scale and marginal productivity.

- $y = 4K_1^{0.3}K_2^{0.3}L^{0.3}$
- $y = \alpha K^2 + \beta L^2$
- $y = \min\{aK, bL\}$
- $y = 4K + 2L$