Econ2020 Midterm1 <KeyPoints elaborate using the Textbook>

1. (**7 marks**) State whether you agree or disagree with each of the following statements. Using appropriate **diagrams, explain** your response (marks will depend on your explanation).

a. The marginal cost curve is the mirror image of marginal product of labor.

Agree.

P214, book

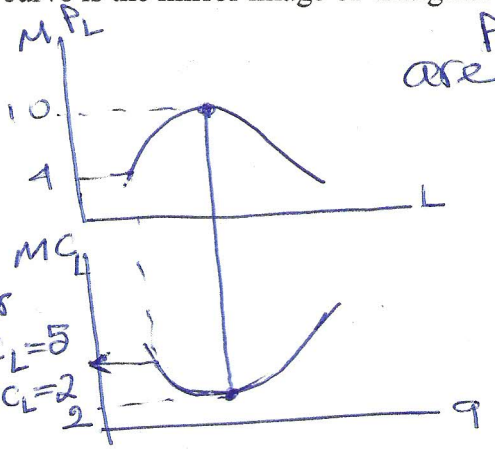
$MC = \frac{W}{MP_L}$

Say $W = \$20$/hour

if $MP_L = 4$, $MC_L = 5$

if $MP_L = 10$, $MC_L = 2$

and so on.



Production and Cost are interdependent.

$q = f(L)$

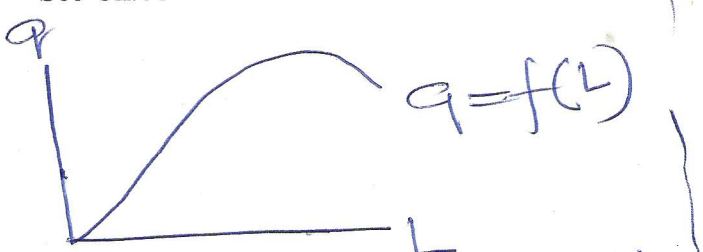
$MP_L = \frac{dq}{dL}$

$c = f(q)$

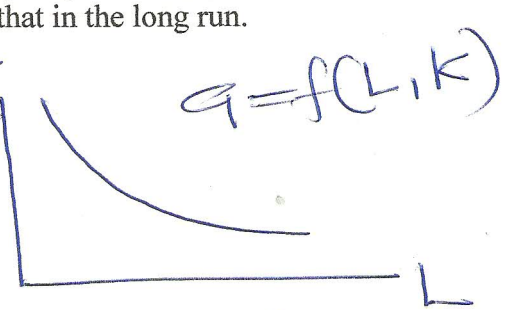
$MC = \frac{dc}{dq}$

b. For a convex iso-quant, the MRTS is diminishing.
Agree. Use figure 6.4 (textbook) and explain.

2. a. (**3**) What is law of diminishing marginal returns? Using diagrams, explain how does the production function in the short-run differ from that in the long run.
See Ch.06



SRPF: One variable input



LRPF : all inputs are variable.

b. (**3**) Consider the following production functions:

i. $q = 5L^{0.8}K^{0.4}$ ii. q= 5L + 10K;

i. Calculate the MRTS of each function. Are the MRTSs diminishing? Explain.

$MRTS = -\frac{MP_L}{MP_K} = -\frac{(dq)/(dL)}{(dq)/(dK)}$; disregard the − sign

(i) $\frac{5(.8)L^{-.2}K^{.4}}{5(.4)L^{.8}K^{-.6}} = \frac{2K}{L}$ if L↑ ratio ↓ ∴ MRTS diminish

(ii) $\frac{5}{10} = \frac{1}{2}$ a Constant ∴ MRTS is not diminishing.

ii. Find the returns to scale of each production function (constant, increasing or decreasing).

Multiply each input by a constant (2)

(i) $5(2L)^{.8}(2K)^{.4} = 5(2)^{1.2}L^{.8}K^{.4} = 2^{1.2}q$

∴ output more than double → increasing RTS

(ii) $5(2L)+10(2K) = 2[5L+10K] = 2q$

or Constant RTS.

c. (**1**) Consider the following production function: $q = L + 30L^2 - L^3$. Find the level of L for which average product equals marginal product.

$AP_L = MP_L$

Or, $1+30L - L^2 = 1 + 60L - 3L^2$

Or, $2L^2 - 30L = 0$; Or, $2L(L-15)=0$

Implying either L=0 or L=15; The APL and MPL will intersect at L=15 (See Figure 6.1)

3. a. (**3**) Using diagrams, discuss the main difference between:
   i. Average costs and marginal cost, ii. Fixed cost and variable cost,
   See Ch.07

b. (**3**) i. Suppose that two firms have exactly the same marginal cost curve, but their average fixed cost curve is not the same. Will their average variable cost curve be the same? Why or why not?

MC and VC are independent of FC i.e. MC= Delta(TC)/Delta(q) = delta(VC)/delta(q).

Therefore the AVC will be the same if MC is the same.

ii. Suppose the cost of producing milkshakes is $C = 10q - 4q^2 + q^3$. What is the equation for marginal cost? Find the q at which the marginal cost is minimized?

$MC = dC/dq = 10 - 8q + 3q^2$

$d(MC)/dq = -8 + 6q = 0$

$q = 8/6$

c. (**1**) If input prices are r=w=10 and $q = K^{0.5}L^{0.5}$, what is the least cost input combination required to produce 100 units of output?

$MRTS = -\frac{MP_L}{MP_K} = -\frac{K}{L}$ } Slope of isoquant

$-\frac{K}{L} = -\frac{w}{r} = -\frac{10}{10}$ ∴ $K = L$

$100 = K^{.5}K^{.5}$ ∴ $K = 100$ & $L = 100$