ECO 610-401 Problem Set #3 Fall 2002

KEY

1. $Q = 286H^{.37}$.
   a) $MP_H = dQ/dH = .37(286)H^{-.63} = 105.82H^{-.63}$.
   b) Yes, since MP_H decreases as horsepower increases.
   c) $AP_H = Q/H = 286H^{-.63}$.
   d) $MRP_H = (MP_H)(MR) = (105.82H^{-.63})(2) = 211.64H^{-.63}$.
   e) Set MRP_H = marginal expenditure on the input: $211.64H^{-.63} = 30$, so $H = 22.22$.

2. (a) $Q = 10K^{1/2}L^{1/2}$

$$MP_L = \frac{dQ}{dL} = 5K^{1/2}L^{-1/2}$$

$$MP_K = \frac{dQ}{dK} = 5K^{-1/2}L^{1/2}$$

(b) $Q = 120 = 10(8)^{1/2}L^{1/2}$

$12 = 8^{1/2}L^{1/2}$

$144 = 8L$

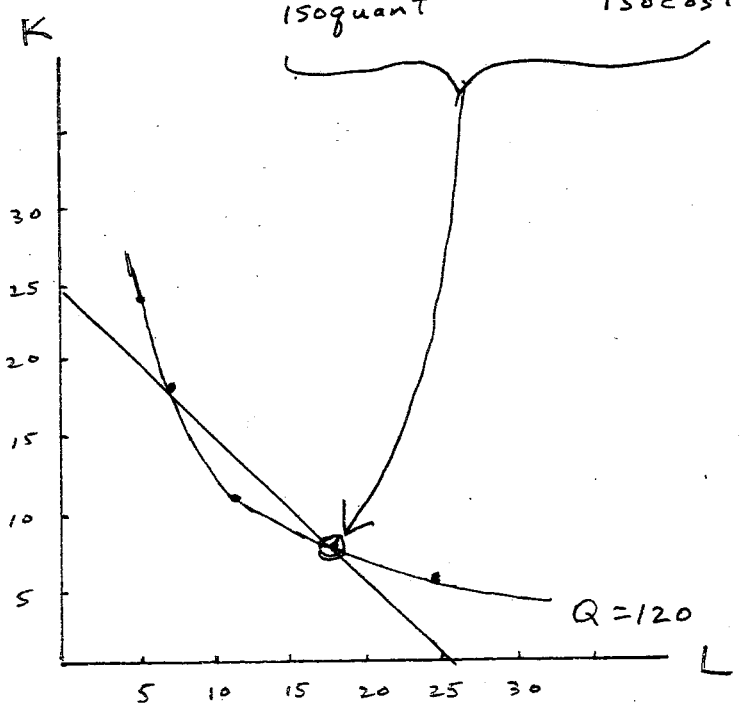
$L = 18$ if $K = 8$ and $Q = 120$

(c) does $\frac{MP_L}{MP_K} \stackrel{?}{=} \frac{w}{v} \Rightarrow \frac{5K^{1/2}L^{-1/2}}{5K^{-1/2}L^{1/2}} \stackrel{?}{=} \frac{6}{6} \Rightarrow \frac{K}{L} \stackrel{?}{=} 1$

$\frac{K}{L} = \frac{8}{18} \neq \frac{6}{6} = \frac{w}{v}$

slope of isoquant < slope of isocost

(c)



isoquant for $Q = 120$

$120 = 10K^{1/2}L^{1/2}$

$12 = K^{1/2}L^{1/2}$

$144 = K \cdot L$

K	L
8	18
18	8
12	12
6	24
24	6

3. Bubba's accounting profit = $130,000 − $112,000 = $18,000

Implicit Costs not accounted for in the above:

① opportunity cost of his time = $10,000
($30,000 − $20,000 he pays himself)

② interest earnings foregone on his investment ($50,000 @ 10%) = $5,000

So economic profits are $3000, after implicit costs are subtracted.

If Bubba were to sell the bar and go to work for someone else, he would bring home $35,000 per year ($30,000 salary plus $5000 interest earnings). That is $3000 less than he currently is making ($20,000 salary plus $18,000 profit).

4. (a) As long as the selling price of a particular product at least covers its variable costs, that product should be retained in the firm's product line. Any excess of price over average variable cost can be applied to pay off the firm's fixed costs. Dropping a product that covers variable costs but not fully allocated total costs will thus cause a decline in total profits.

(b) Annual economic profit for the next four years if we keep the old machine:
$100,000 - $80,000 - $1,000 = $19,000,
since our costs include operating expenses for the old machine minus economic depreciation.

Annual economic profit if we buy and use the new machine:
$100,000 - $56,000 - $15,000 = $29,000,
since annual economic depreciation on the new machine will average $15,000 per year.

Go with the new machine.