

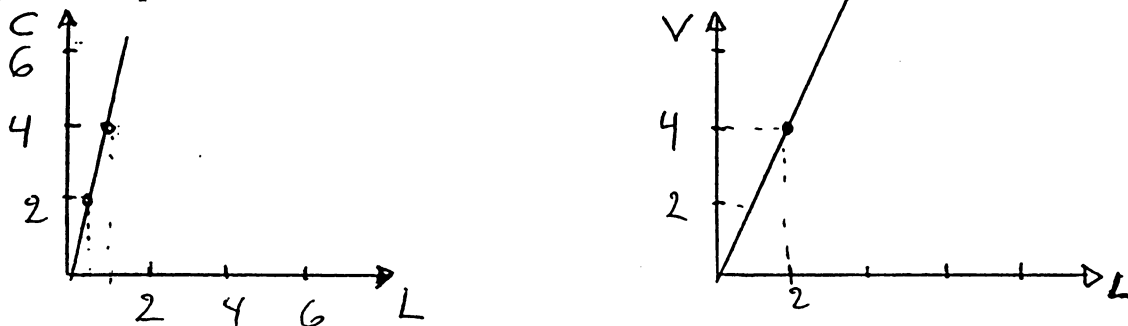
Homework 0
Answer Key

(I) Consider the following two production functions for cheese and wine. Labor (L) is the only input:

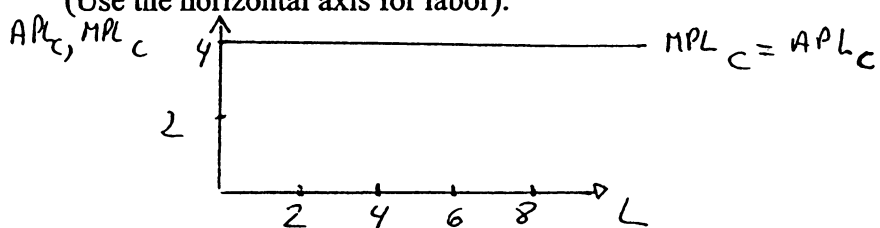
Cheese: $C = 4L$

Wine: $V = 2L$

a) Plot both production functions. Use the horizontal axes for labor



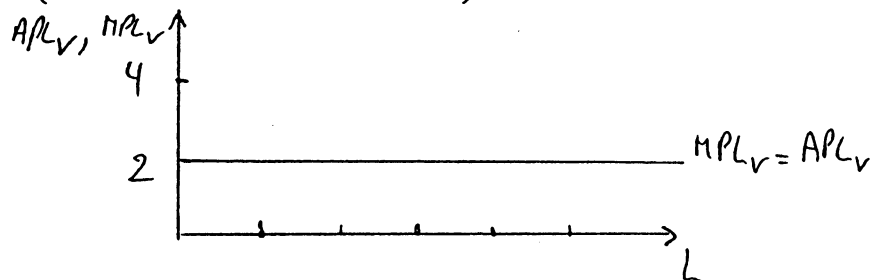
b) Calculate and plot the Marginal and Average Products of Labor in the production of cheese (Use the horizontal axis for labor).



$$MPL_C = \left(\frac{\Delta C}{\Delta L} \right)_{\text{SMALL CHANGES}} = 4$$

$$APL_C = \frac{C}{L} = 4$$

c) Calculate and plot the Marginal and Average Products of Labor in the production of wine (Use the horizontal axis for labor).



$$MPL_V = \left(\frac{\Delta V}{\Delta L} \right)_{\text{SMALL CHANGES}} = 2$$

$$APL_V = \frac{V}{L} = 2$$

d) What is the Unit Labor Coefficient in the production of cheese?

$$a_C = \frac{1}{4}$$

e) What is the Unit Labor Coefficient in the production of wine?

$$a_V = \frac{1}{2}$$

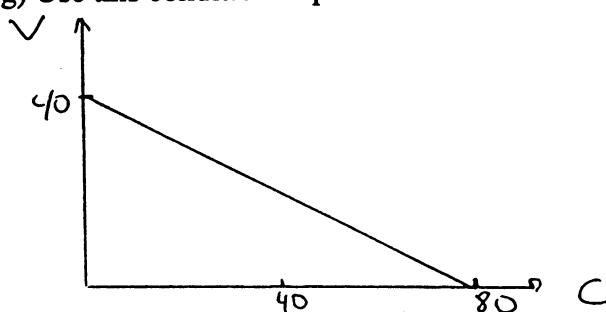
Now suppose that you are told that a country has a total of 20 workers and that the country can only produce two goods (Cheese and Wine) according to the production functions specified above.

f) Write down the full employment condition.

$$\text{TOTAL \# WORKERS} = \text{\# WORKERS USED IN CHEESE SECTOR} + \text{\# WORKERS USED IN WINE SECTOR}$$

i.e.
$$\boxed{20} = a_C \cdot C + a_V \cdot V = \boxed{\frac{1}{4} \cdot C + \frac{1}{2} \cdot V}$$

g) Use this condition to plot the PPF.



$$\begin{aligned} \text{IF } C=0 &\Rightarrow V=40 \\ \text{IF } V=0 &\Rightarrow C=80 \end{aligned}$$

Now suppose that the wage is \$2.

h) What is that average cost of producing Cheese? Wine?

$$\boxed{AC_C} = a_C \cdot W = \frac{1}{4} \times 2 = \boxed{\frac{1}{2}}$$

$$\boxed{AC_V} = a_V \cdot W = \frac{1}{2} \times 2 = \boxed{1}$$

i) Will a profit maximizing firm produce any cheese if the price of cheese is $\frac{1}{2}$? Justify briefly.

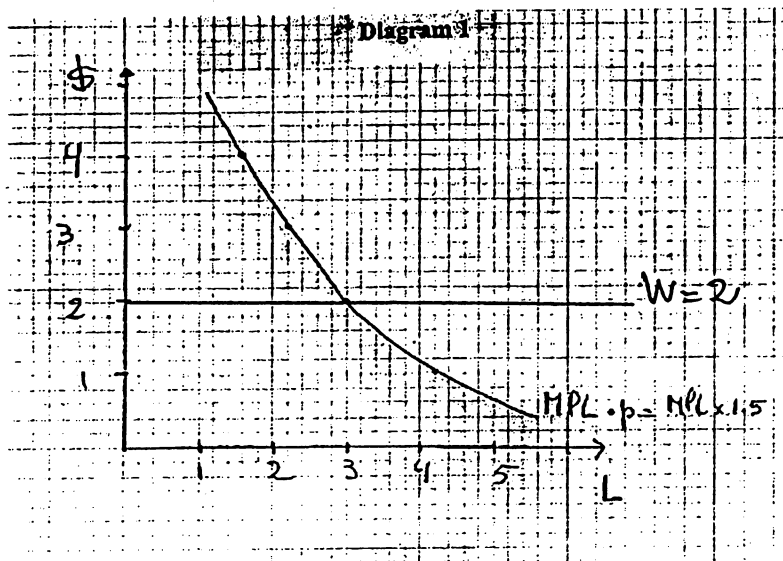
YES, SINCE THE PRICE OF CHEESE IS EQUAL TO THE MARGINAL COST OF PRODUCING CHEESE = $AC_C = \frac{1}{2}$ (IN THIS CASE BECAUSE OF THE LINEAR TECHNOLOGY)

j) Will a profit maximizing firm produce any wine if the price of wine is $\frac{1}{2}$? Justify briefly.

NO, BECAUSE THE PRICE OF WINE IS LOWER THAN THE MARGINAL COST OF PRODUCING WINE = $AC_V = 1$

(II) Consider a production function for commodity A that uses labor as the only input and has a "nice" shape. In this case the Marginal Product of Labor (MPL) is a decreasing function of the amount of labor used. Assume further that the price of commodity A is 1.5, so the Value of the Marginal Product of Labor curve ($MPL \cdot P = MPL \times 1.5$) is shown in Diagram 1 below. Use the Diagram to answer the following questions.

- (1) How many units of labor will a profit maximizing firm hire if the wage is 2?
- (2) Suppose now that the wage goes up. Will the firm hire more or less workers than in (1)? Justify briefly.



- (1) 3 WORKERS, SINCE AT $L = 3$, $W = \frac{MPL \times 1.5}{\text{WAGE}} = \text{VALUE OF MARGINAL PRODUCT}$
- (2) LESS WORKERS. SINCE A PROFIT MAXIMIZING FIRM WILL HIRE WORKERS ONLY UP TO THE POINT WHERE: $W = MPL \times P$ - IF $W \uparrow$, $MPL \downarrow$ AND THIS ONLY HAPPENS IF $L \downarrow$.

(III) Consider a country that can produce only two commodities: Apples (A) and Bananas (B). The country's production possibility frontier (PPF) is drawn in Diagram 2 below. Assume further that these two commodities can be sold in the international market at the following prices: $p_A = 2$ and $p_B = 4$.

- (1) Define an isovalue line and draw several isovalue lines in Diagram 2.
- (2) When firms maximize profits, the value of a country's production is maximized. Indicate the combination of Apples and Bananas that will be produced in the country?

(1) DEF: ISOVALUE LINE: COMBINATIONS OF APPLES AND BANANAS THAT HAVE THE SAME VALUE - THAT IS:

$$\boxed{V} = p_A \cdot A + p_B \cdot B = \boxed{2 \cdot A + 4 \cdot B}$$

$$\text{LET } \bar{V} = 4 \Rightarrow 4 = 2 \cdot A + 4 \cdot B$$

$$\text{LET } \bar{V} = 8 \Rightarrow 8 = 2 \cdot A + 4 \cdot B$$

Diagram 2

