

Review, First Quiz  
Managerial Economics: Eco 685  
Quiz Date: Friday, February 4, 2005

All questions come from the class notes: Introduction, Production Theory, and Cost Theory up to section V. Notice that we skipped sections III and VI of production theory. The chapters in the book are 1, 7, and 9 (chapter 2 contains a math review). Additional study materials: study guide, list of definitions, case studies on the web site, the first homework and this review sheet. Note: this review covers only material since the last homework. The following equations are provided.

$$pv = \sum_{t=1}^n \frac{\pi_t}{(1+i)^t}, \quad \pi_t = TR_t - TC_t$$

Economic Profits = accounting profit – return on capital used – owner's labor

$$\frac{\partial bL^c}{\partial L} = bcL^{c-1}, \quad \frac{\partial a + bL^c}{\partial K} = 0, \quad \frac{\partial \text{objective}}{\partial \text{decisions}} = 0 \text{ at the maximum}$$

$$MRP = \frac{\partial TR}{\partial \text{input}} = MR \cdot MP, \quad ME = \frac{\partial TC}{\partial \text{input}}, \quad MR = \frac{\partial TR}{\partial Q}$$

$$MRP = \frac{\Delta TR}{\Delta \text{input}}, \quad MP = \frac{\Delta TR}{\Delta \text{input}}$$

$$MP = \frac{\partial Q}{\partial \text{input}}, \quad \frac{MP_K}{MP_L} = \frac{P_k}{P_L}$$

$$TC = TFC + TVC, \quad ATC = \frac{TC}{Q}, \quad AFC = \frac{TFC}{Q}$$

$$AVC = \frac{TVC}{Q}, \quad MC = \frac{\partial TC}{\partial Q}, \quad Q_{\text{break even}} = \frac{TFC}{P - AVC}$$

### Question 1

Suppose a firm uses two inputs, unskilled labor ( $u$ ) and skilled labor ( $s$ ) to produce output ( $Q$ ). The production function is:

$$Q = 30s + 20u - \frac{1}{2}s^2 - \frac{1}{4}u^2 \quad (1)$$

The price of skilled labor is \$10 per hour and the price of unskilled labor is \$5.

- Calculate  $\frac{MP_s}{MP_u}$  and  $\frac{P_s}{P_u}$ .
- Solve for the relationship between the optimal number of skilled and unskilled workers. The firm currently employs 3 units of skilled workers and 10 units of unskilled workers. Is this optimal?
- Suppose the budget is \$60. How many units of skilled and unskilled labor should the firm hire?

### Question 2

The Miami Spring League (MSL), an ultimate Frisbee league run by your professor, has the following costs:

Category	Cost	Units
Field Rental	\$1,600	Per Season
T-shirts	\$6	Per Person
T-shirts (set up cost)	\$60	Per Season
Salaries	\$375	Per season
Party	\$6	Per person attending (50% chance of attending)
Chalk	\$10	Per week (10 week season)

Assume the opportunity cost of your professor's time is zero.

- Calculate the total fixed costs.
- Suppose the fields must be paid for in advance. After observing how many sign up we can then decide whether or not to have the league and pay the rest of the costs. At this time, what costs are sunk?
- Calculate total costs as a function of  $Q$ , the number of players.
- Calculate average variable costs.
- The price is \$25 per person. Calculate the break even point.
- A total of 135 players signed up. Calculate the profit.

**Question 3**

Suppose the ratio of marginal products is greater than the price ratio:

$$\frac{MRP_s}{MRP_u} > \frac{P_s}{P_u} \quad (2)$$

Here  $s$  is skilled labor and  $u$  is unskilled labor. Give one strategy to increase profits.

**Question 4**

A power plant's fuel costs are given by:

$$TC = 16.68 + 0.125Q + 0.00439Q^2 \quad (3)$$

Here  $Q$  represents kilowatt hours of electricity produced. The firm can sell electricity on the wholesale market for \$0.13 per kilowatt hour.

- a. Calculate the total fixed costs, average total costs, and marginal cost functions.
- b. Calculate the profit maximizing level of output.