Monmouth COLLEGE

- Name: _____
- Date: _____
- Section: _____

ECON 300: Intermediate Price Theory

Problem Set #5 - Part #2

Fall 2024

Problem 1. The Cost Minimization Problem

Suppose that your firm is producing output Q with using two inputs, labor L and capital K. The wage is given as w and rent is given as r. The firm following technology:

$$F(L, K) = L^{\frac{1}{2}} K^{\frac{1}{2}}$$

1.A. Find the Marginal Product of Labor (MP_L).

- $MP_L =$

1.B. Find the Marginal Product of Capital (MP_K).

- $MP_K =$

1.C. Find the Marginal Rate of Technical Substitution $(MRTS_{LK})$

- $MRTS_{LK} =$

1.D. Find the firm's optimal ratio of inputs L and K.

1.E. Given a production quota of 100, what is the optimal quantities of L and K that minimizes the firm's production costs?

Problem 1. The Cost Minimization Problem (continued)

Suppose that your firm is producing output Q with using two inputs, labor L and capital K. The wage is given as w and rent is given as r. The firm following technology:

$$F(L, K) = L^{\frac{1}{2}} K^{\frac{1}{2}}$$

1.F. Given a production quota of $\bar{Q}$, what is the optimal quantities of L and K that minimizes the firm's production costs?

1.G. Find the firm's total cost function $TC(Q)$.

1.H. Find the firm's average total cost function $ATC(Q)$.

1.I. Find the firm's marginal cost function $MC(Q)$.

Problem 2. The Profit Maximization Problem

Suppose that a firm is operating in a perfectly competitive factor and output market where the unit price of the firm's output is given as $P = 200$. The firm's total cost function is given as:

$$TC(Q) = Q^2 - 10Q + 2500$$

2.A Find the firm's total revenue function $TR(Q)$.

2.B Find the firm's marginal revenue function $MR(Q)$.

2.C Find the firm's marginal cost function $MC(Q)$.

2.D If the firm finds that their marginal revenue is greater than their marginal cost of production at the current level of output, should they change their level of output? Why?

Problem 2. The Profit Maximization Problem (continued)

Suppose that a firm is operating in a perfectly competitive factor and output market where the unit price of the firm's output is given as $P = 200$. The firm's total cost function is given as:

$$TC(Q) = Q^2 - 10Q + 2500$$

2.E What is the firm's profit maximizing level of output?

2.F What is the firm's production cost associated with the profit maximizing quantity?

- Score: _____
- Extra Credit: _____