University of the People

ECON 1580 Introduction to Economics

Unit 4 Written Assignment 4

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Monopoly Firm Analysis Assignment

This document provides a detailed analysis of a monopoly firm's pricing, output, and profit decisions based on the given demand and cost functions. The analysis includes the effects of per-day and per-unit taxes on the firm's operations.

# (a) How much will the firm produce?

A monopoly maximizes profit where marginal revenue (MR) equals marginal cost (MC).  
Given:  
Demand: P = 500 - 10Q  
MC = 100  
  
Total Revenue (TR) = P \* Q = (500 - 10Q)Q = 500Q - 10Q^2  
Marginal Revenue (MR) = d(TR)/dQ = 500 - 20Q  
Setting MR = MC:  
500 - 20Q = 100  
20Q = 400  
Q = 20  
  
Therefore, the firm will produce 20 units.

# (b) How much will it charge?

Substitute Q = 20 into the demand equation:  
P = 500 - 10(20) = 500 - 200 = 300  
  
The firm will charge $300.

# (c) Can you determine its profit per day?

Profit (π) = Total Revenue (TR) - Total Cost (TC)  
TR = 300 \* 20 = 6,000  
TC = 100 \* 20 = 2,000  
π = 6,000 - 2,000 = 4,000  
  
The firm's profit is $4,000 per day.

# (d) How will a $1,000 per day tax affect its price?

A lump-sum tax does not affect marginal cost or marginal revenue.  
Therefore, the price remains unchanged at $300.

# (e) How would the $1,000 per day tax affect output per day?

Since the tax does not affect marginal cost, the output remains the same at 20 units.

# (f) How would the $1,000 per day tax affect profit per day?

Profit reduces by the tax amount:  
New profit = 4,000 - 1,000 = 3,000  
  
The firm's profit is $3,000 per day after the tax.

# (g) How will a $100 per unit tax affect the firm's price?

A per-unit tax increases marginal cost by $100.  
New MC = 100 + 100 = 200  
Set MR = MC:  
500 - 20Q = 200  
20Q = 300  
Q = 15  
New price:  
P = 500 - 10(15) = 500 - 150 = 350  
  
The firm's price increases to $350.

# (h) How would the $100 per unit tax affect output per day?

Output decreases to 15 units.

# (i) How would the $100 per unit tax affect profit per day?

TR = 350 \* 15 = 5,250  
TC = 200 \* 15 = 3,000  
π = 5,250 - 3,000 = 2,250  
  
The firm's profit is $2,250 per day.

# Summary Table

|  |  |  |  |
| --- | --- | --- | --- |
| Scenario | Price | Output | Profit |
| No tax | $300 | 20 | $4,000 |
| $1,000/day tax | $300 | 20 | $3,000 |
| $100/unit tax | $350 | 15 | $2,250 |