Econ 3012 - Final Exam

December 8, 2023

1. *Briefly describe the following in a way that a person who* ***has not studied economics or mathematics would understand****:*

A. Why does a firm choose to operate where marginal cost is equal to marginal revenue?

Marginal revenue is how much revenue goes up when we change quantity. Marginal cost is how cost goes up when we change quantity. If these aren't equal than we can either increase quantity and revenue will go up more than cost (increasing profit) or we can decrease quantity can cost will decrease faster than revenue (also increasing profit).

B. What is a two-part tariff?

A pricing scheme used when consumers buy multiple of some good or service. The firm charges an up-front fee that then gives the consumer the right to buy units of that good/service at a lower price.

C. What does it mean for a production function to have decreasing returns to scale?

It means that if the firm were to scale up their use of inputs, for instance doubling them, the production would less than double. It implies that as a firm tries to grow it's production, it becomes less and less efficient.

2. *Fill in the blank.*

A. We can be sure a consumer who is a borrower will remain a borrower and be strictly better off when **interest rates decrease**.

B. If some of a consumer's indifference curves slope upwards, the consumer's preferences are not **monotonic**.

C. In general equilibrium, prices are said to be equilibrium prices if **total demand** for every good is equal to **total endowments**.

3. A market's demand is $Q = 3000 - p$. Each firm in the market has zero cost. That is $c(q) = 0$.

A) If there is only one firm in this market (a monopolist), what is their profit function?

$\pi(q) = q(3000 - q)$

B) What quantity does a monopolist produce to maximize profit?

$q = 1500$

C) If there are two firms in this market. Firm 1 produces q_1 and firm 2 produces q_2, what is firm 1's profit function?

$\pi_1(q_1, q_2) = q_1(3000 - (q_1 + q_2))$

D) What is firm 1's best response function?

$q_1 = \frac{1}{2}(3000 - q_2)$

E) What quantities do the firms produce in a symmetric Nash equilibrium?

$q = 1000$

F) If the firms agree to collude and each choose the same quantity q, what q will maximize their joint profits?

$\pi_1(q, q) = q(3000 - (q + q))$

$\frac{\partial(q(3000-(q+q)))}{\partial q} = 3000 - 4q$

$3000 - 4q = 0$

$q = 750$

4. A firm has production function $f(x_1, x_2) = x_1^{\frac{1}{3}} x_2^{\frac{1}{3}}$. Price of input 1 is $w_1 = 4$ and price of input 2 is $w_2 = 1$.

A) Does this firm have increasing, decreasing, or constant returns to scale?

Decreasing.

B) What are the x_1 and x_2 that minimize the cost of producing output y?

$x_1 = \frac{1}{2}y^{3/2}, x_2 = 2y^{3/2}$

C) What is the firm's cost function in terms of output y?

$c(y) = 4y^{3/2}$

D) If this firm was a price-taker and the price of output was $p = 600$ what is the firm's profit function?

$\pi(y) = 600y - \left(4y^{3/2}\right)$

E) What output would the firm produce in part D?

$y = 10000$

F) Show that firm's production function is homothetic.
$TRS = \frac{x_2}{x_1}$ which only depends on the ratio of x_2 and x_1.

5. In a market, demand is $Q = 400 - p$ and supply is $Q = 3p$.

A) What is the equilibrium price and quantity in this market?

$q = 300, p = 100$

B) What is the price elasticity of demand at the price you found in part A?

$-\frac{1}{3}$

C) Given your answer to part B, if price were to increase by 1%, approximately what would happen to demand?

Decrease by $\frac{1}{3}\%$

D) What is the equilibrium price and quantity if the government imposes a $t = 200$ quantity tax?

$q = 150, p = 50$

E) What is the dead-weight-loss associated with this tax?

$\frac{200*150}{2} = 15000$