

Exercise Session 5 (PS4 Solutions)

Principles of Economics I



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Oct 6, 2023

Q1

- a. Does not matter if you have already worked more than a year or less than 6 months. If you are in between, your outside option of getting unemployment benefit is less attractive. reservation wage \downarrow \rightarrow employment rent \uparrow
- b. You are now equipped with skills that will allow you to find even better jobs outside. reservation wage \uparrow \rightarrow Employment rent \downarrow
- c. Your outside option of moving to the strong competitor is more attractive. reservation wage \uparrow \rightarrow Employment rent \downarrow

Q1

d. For the last few years of working, you get a larger percentage increase in your pension if you work. There are 2 opposite effects: shorter horizon, but more pension contribution.

It is an empirical question whether one is better off continuing working or not.

Q2

Accept any alternative answers that make sense.

a) Setting up the research laboratory is a **FIXED COST**. It is an upfront cost to be able to start production and does not vary in the short term.

Alternative answer: in the span of many years, it is a variable cost because it expands in proportion to how much vaccine you produce

b) Hiring famous actors is a **FIXED COST**. After paying them to promote your game, it does not matter how many units you sell.

Alternative answer: a variable cost if you have commission contract with the famous actors specifying that they get paid in proportion to the amount you sell.

Q2

c) Renting the premises is a **FIXED COST**. It is an upfront cost to be able to start production and does not vary in the short term.

Alternative answer: a variable cost if you rent additional premises or increase the size of the premise to keep up with high demand in the span of many years.

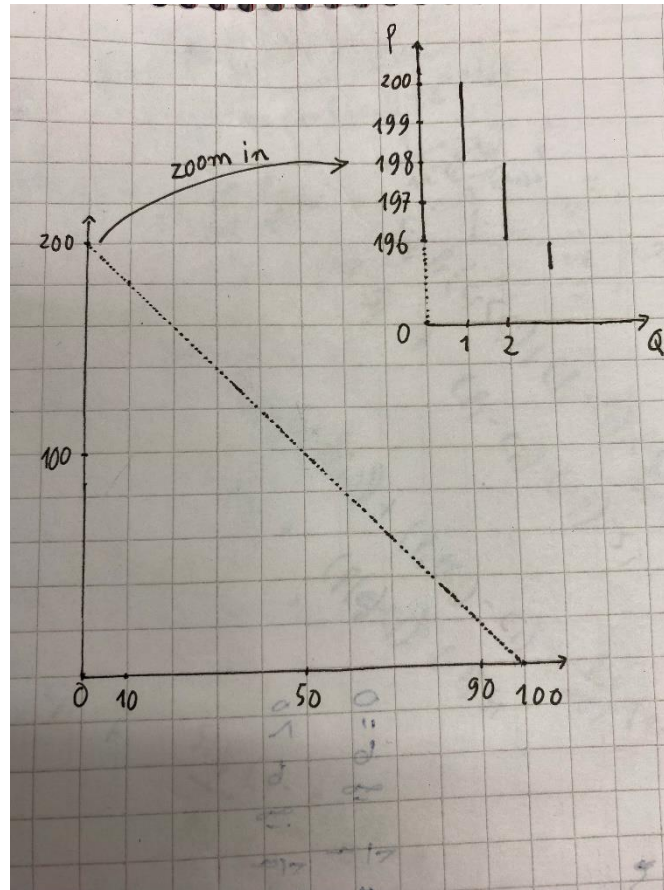
d) Hiring temporary help is a **VARIABLE COST**. You decide on the number of temps based on how much sales the cafe has.

Alternative answer: a fixed cost if we think of the span of 1 month. You need to pay the wage upfront regardless of how much sales the cafe has.

Q3

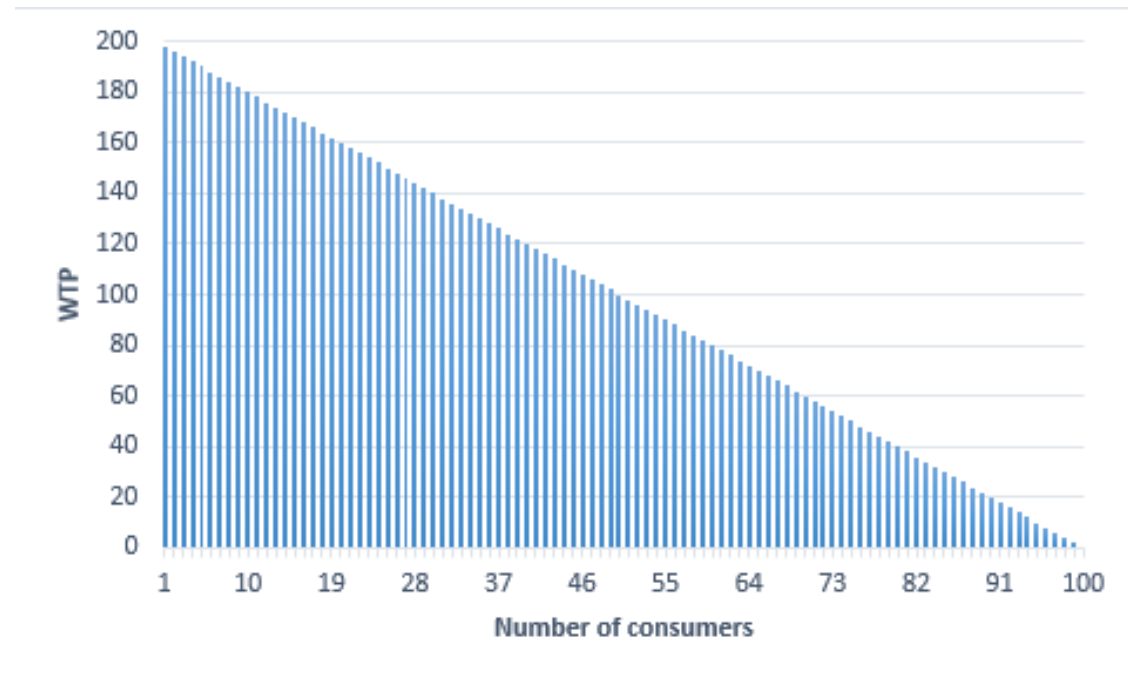
- a) This demand curve is not continuous. For each Q , the vertical line denotes all prices P such that the number of consumers with wtp at least P is Q .

Full points if pointing out the demand curve is not continuous.



Q3

a) Accepted graph from softwares:



Q3

b) This demand curve is continuous.

The revenue function:

$$R(Q) = P(Q) * Q = (200 - 2Q)Q = 200Q - 2Q^2$$

The marginal revenue:

$$MR(Q) = \frac{dR(Q)}{dQ} = 200 - 4Q$$

Q3

c) Demand curve:

$$P(Q) = \begin{cases} 125 - 0.5Q & \text{if } Q \leq 100 \\ 0 & \text{if } Q > 100 \end{cases}$$

The revenue function:

$$R(Q) = P(Q) * Q = \begin{cases} 125Q - 0.5Q^2 & \text{if } Q \leq 100 \\ 0 & \text{if } Q > 100 \end{cases}$$

The marginal revenue:

$$MR(Q) = \frac{dR(Q)}{dQ} = \begin{cases} 125 - Q & \text{if } Q \leq 100 \\ 0 & \text{if } Q > 100 \end{cases}$$

Q3

d)

$$C(Q) = \begin{cases} F + 10Q & \text{if } Q > 0 \\ 0 & \text{if } Q = 0 \end{cases}$$

$$MC(Q) = \frac{dC(Q)}{dQ} = 10 \text{ if } Q > 0$$

Optimal price and quantity:

$$MC(Q^*) = MR(Q^*)$$

$$10 = 125 - Q^*$$

$$Q^* = 115$$

$$P^*(Q^*) = 125 - 0.5 * 115 = 67.5$$

Q4

a) Marginal costs:

$$MR_P(Q_P) = 200 - 4Q_P$$

$$MR_S(Q_S) = 100 - 2Q_S$$

Optimal price and quantity for professionals:

$$MR_P(Q_P^*) = MC_P(Q_P^*) = 0$$

$$Q_P^* = 50$$

$$P_P^*(Q_P^*) = 200 - 2 * 50 = 100$$

Optimal price and quantity for students

$$MR_S(Q_S^*) = MC_S(Q_S^*)$$

$$Q_S^* = 50$$

$$P_S^*(Q_S^*) = 100 - 50 = 50$$

Q4

b) Demand in Finland

- Professionals

$$P_P(Q_P) = 200 - 2Q_P$$

$$Q_P = 100 - 0.5P_P$$

- Students

$$P_S(Q_S) = 100 - Q_S$$

$$Q_S = 100 - P_S$$

Q4

b) Total demand in Finland and Sweden:

$$Q_{TP} = 200 - P_P$$

$$Q_{TS} = 200 - 2P_S$$

The demand function can be rewritten:

$$P_P = 200 - Q_{TP}$$

$$P_S = 100 - \frac{Q_{TS}}{2}$$

Q4

b) Marginal costs:

$$MR_P(Q_{TP}) = 200 - 2Q_{TP}$$

$$MR_S(Q_{TS}) = 100 - Q_{TS}$$

Optimal price and quantity for professionals:

$$MR_P(Q_{TP}^*) = MC_P(Q_{TP}^*) = 0$$

$$Q_{TP}^* = 100$$

$$P_P^*(Q_P^*) = 200 - 100 = 100$$

Optimal price and quantity for students

$$MR_S(Q_{TS}^*) = MC_S(Q_{TS}^*)$$

$$Q_S^* = 100$$

$$P_S^*(Q_S^*) = 100 - 100/2 = 50$$

The optimal prices stay the same as in part a.

Q4

c) Combined demand of professionals and students in Finland:

$$Q_P = 100 - 0.5P_{combined}$$

$$Q_S = 100 - P_{combined}$$

$$Q_{combined} = Q_P + Q_S = 200 - 1.5P_{combined}$$

$$P_{combined} = \frac{200}{1.5} - \frac{Q_{combined}}{1.5} = \frac{400}{3} - \frac{2Q_{combined}}{3}$$

$$MR(Q_{combined}) = \frac{400}{3} - \frac{4Q_{combined}}{3}$$

Optimal price and quantity for the combined market:

$$MR(Q_{combined}^*) = MC(Q_{combined}^*) = 0$$

$$Q_{combined}^* = 100, P_{combined}^* = \frac{400}{3} - \frac{200}{3} = \frac{200}{3}$$

Q4

d) Combined demand of professionals and 2 types of students in Finland:

$$Q_P = 100 - 0.5P_{combined2}$$

$$Q_{internationals} = Q_{foreigns} = 100 - P_{combined2}$$

$$Q_{combined2} = Q_P + Q_{internationals} + Q_{foreigns} = 300 - 2.5P_{combined2}$$

$$P_{combined2} = \frac{300}{2.5} - \frac{Q_{combined2}}{2.5} = 120 - \frac{2Q_{combined2}}{5}$$

$$MR(Q_{combined2}) = 120 - \frac{4Q}{5}$$

Optimal price and quantity for the 2nd combined market:

$$MR(Q_{combined2}^*) = MC(Q_{combined2}^*) = 0$$

$$Q_{combined2}^* = 150, P_{combined2}^* = 120 - 2 * \frac{150}{5} = \mathbf{60}$$