

Practice Problem Set 10

180.102 Elements of Microeconomics - TA Section 03

Pinda Wang, 1 November 2024

1. Suppose the market for light bulbs is perfectly competitive. There are N firms producing light bulbs, each of which faces the following cost curves:

$$FC = 18$$

$$MC = 9q$$

$$VC = 4.5q^2$$

Market demand and short-run market supply are respectively given by:

$$Q_d = 1080 - 10P$$

$$Q_s = 50P$$

- (a) What is the price and quantity (of the entire market) in equilibrium?
- (b) How many firms are in this market? How many light bulbs does each firm produce?
- (c) How much profit does each firm earn?

Now suppose that the rent has increased for the land on which the light bulb factories are built.

- (d) How does this affect firms' cost curves (MC, AVC, ATC)?
- (e) In the short run, how does the price and total quantity change? How many light bulbs does each firm produce? Will firms choose to shut down? Why?
- (f) In the long run, how does the price, total quantity, and each firm's production decisions change? Why?

Solutions to Practice Problem Set 10

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1. (a) In equilibrium, $Q = 1080 - 10P = 50P \implies Q^* = 900, P^* = 18$.
- (b) In equilibrium in a perfectly competitive market, $P^* = MC$. We have $18 = 9q \implies q^* = 2$. The number of firms is $N = Q^*/q^* = 900/2 = 450$.
- (c) No calculation is necessary: the profit of each firm in a perfectly competitive market is 0. Here we calculate it just to be sure: Profit = $P^*q - VC - FC = 18 \times 2 - 9 \times 2 - 18 = 0$.
- (d) The rent for factory land is part of the fixed cost. So, MC and AVC do not change, but ATC increases.
- (e) In the short run, since MC and AVC do not change, the firms' production decisions also do not change. Then, price and total quantity do not change, and each firm still produces 2 light bulbs. No firms choose to shut down, because P and AVC has not changed. The only difference is that the firms not run at a loss.
- (f) Because firms not incur a loss, some firms will exit the market in the long run, shifting the long-term supply curve to the left. Market price will increase, and total quantity will decrease. The quantity of light bulbs that each firm produces will increase, because with a price increase, firms are moving upwards along the individual firm's supply curve (which is also the MC curve). The number of firms will decrease.