

Econ 73-250A-F  
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### Class #25 - Review Exercise

Consider a competitive industry consisting of a large number of identical price-taking firms, each of which has the cost function:

$$\begin{aligned}c(y) &= 4y^2 + 16 \text{ if } y > 0 \\c(y) &= 0 \text{ if } y = 0,\end{aligned}$$

where  $y$  is the output of a typical firm. The market demand curve in this industry is described by the equation:

$$Q_D(p) = 200 - 2p,$$

where  $Q_D(p)$  is the quantity demanded when the market price is  $p$ .

(a) Suppose that there are  $N$  firms in the industry. Derive the equation of the industry supply curve (i.e. express total industry supply as a function of  $N$  and  $p$ ).

(b) Determine the long-run equilibrium number of firms in this industry. What is the equilibrium price of the good? How much output does a typical firm produce? What is the total amount of output produced in this market? What are the profits earned by a typical firm? What is the surplus of consumers?

(c) Suppose now that the government decides to subsidize this industry by rebating to consumers 50% of the sales price of the good. That is, if the market price of the good is  $p$ , then consumers pay only  $0.5p$  in order to obtain a unit of the good. Assuming that the number of firms remains fixed (in the short-run) at the value determined in part (b), compute the new equilibrium price (i.e., the price received by firms). What price do consumers pay? How much output does a typical firm produce? What is the total amount of output produced in the market? What are the profits earned by a typical firm?

(d) After the imposition of the subsidy, what is the new long-run equilibrium number of firms in this industry? How many new firms enter the industry as a result of the government subsidy?

(e) Suppose that, instead of being competitive, the industry is a monopoly. The monopolist has the same cost function as one of the typical firms above. What is the price chosen by the monopolist? What is the quantity of the good produced? What are the profits of the monopolist? What is the surplus of consumers?

(f) Repeat the subsidy exercise of point (c) for the monopolist. How does the subsidy affect the price of the good received by the monopolist? How does it affect the quantity produced?