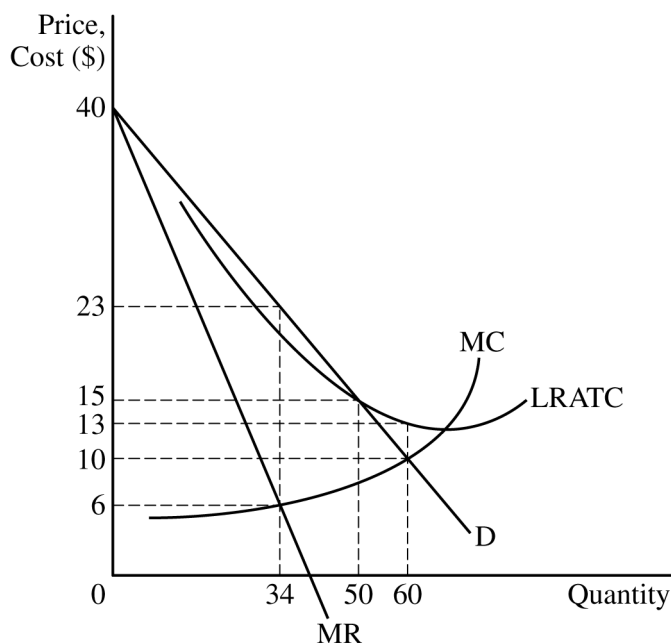3. The graph provided shows the demand (D), long-run average total cost (LRATC), marginal cost (MC), and marginal revenue (MR) curves for a natural monopoly.

(a) Over the output range of 0 to 60 units, is this firm experiencing economies of scale, diseconomies of scale, or constant returns to scale? Explain.

(b) Using numbers from the graph, identify the price and quantity produced at which the monopolist earns zero economic profit.

(c) Assume that regulators impose a price ceiling that results in the firm producing the socially optimal quantity in the short run.

    (i) Calculate the total revenue at the price ceiling. Show your work.
    (ii) Explain why the firm requires a subsidy to continue producing in the long run.
    (iii) Calculate the lump-sum subsidy that would be required for the monopolist to produce the socially optimal quantity in the long run. Show your work.

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Begin your response to this question at the top of a new page in the separate Free Response booklet and fill in the appropriate circle at the top of each page to indicate the question number.

GO ON TO THE NEXT PAGE.

Question 3: Short   5 points

(a)	State that the firm is experiencing economies of scale and explain that the long-run average total cost (LRATC) curve is downward sloping over the range of 0 to 60 units.	**1 point**
(b)	State that the price is $15 and the quantity is 50 units.	**1 point**
(c) (i)	Calculate the total revenue at the socially optimal quantity as $600 and show your work. $$\text{Total Revenue} = \text{Price} \times \text{Quantity} = \$10 \times 60 = \$600$$	**1 point**
(ii)	Explain that at the socially optimal quantity, the firm is earning negative economic profit in the short run because price is less than average total cost.	**1 point**
(iii)	Calculate the lump-sum subsidy as $180 and show your work. $$\text{Lump-sum Subsidy} = \left(\text{LRATC} - \text{Price}\right) \times \text{Quantity} = \left(\$13 - \$10\right) \times 60 = \$180$$	**1 point**

Total for part (c)	**3 points**
Total for question 3	**5 points**