

**Unit 7.**  
**Firm behaviour**  
**and market structure:**  
**monopoly**

## **In accordance with the APT programme objectives of the lecture are to help You to:**

- identify and examine the sources of monopoly power;
- understand the relationship between a monopolist's demand curve and its total and marginal revenue curves;
- compare a monopolist's price, level of output and profit with those of a firm operating in a perfectly competitive market;
- learn how and why competitive markets achieve an efficient allocation of resources, whereas monopolists do not; and show the efficiency loss due to monopoly;
- understand the model of price discrimination as a dimension of monopoly behaviour.

# Required reading

Begg, D., R.Dornbusch, S.Fischer. Economics. 8th edition. McGraw Hill. 2005.

## **Chapter 8. Perfect competition and pure monopoly:**

**8.6. Pure monopoly: the opposite limiting case;**

**8.7. Profit-maximizing output for a monopolist;**

**8.8. Output and price under monopoly and perfect competition;**

**8.9. A monopoly has no supply curve;**

**8.10. Monopoly and technical change.**

## **Chapter 9. Market structure and imperfect competition:**

**9.1. Why market structures differ.**

## **Chapter 17. Industrial policy and competition policy:**

**17.3. The social cost of monopoly power;**

**17.4. Competition policy;**

**17.5. Mergers.**

## **Chapter 18. Natural monopoly: public or private?**

# Questions to be revised

- ✓ The relationships among the short-run and long-run costs: total, average and marginal;
- ✓ Total and marginal revenue;
- ✓ Elasticity and producers' total revenue;
- ✓ The profit-maximizing rule;
- ✓ Profit maximization by a competitive firm in the short run and in the long run;
- ✓ Market supply under perfect competition;
- ✓ Equilibrium and efficiency of a competitive market;
- ✓ Dead weight loss;
- ✓ Per-unit tax, competitive equilibrium and efficiency.

# Market structure determinants

*Legislative barriers to entry:* patents and copyrights; government licenses or franchises;

*Technological barriers to entry:* economies of scale relative to market size; network economies.

The minimum efficient scale is the minimum output at which a firm's long-run average cost curve stops declining.

The minimum efficient scale as related to the size of the market determines the number of firms that is appropriate for the industry.

There is a natural monopoly when the minimum efficient scale is relatively large as compared to size of the market.

*Strategic barriers to entry:* actions of monopolists (investment, price-setting, exclusive control over important inputs) that prevent entry of potential competitors to the market.

# Profit-maximizing Output for a Monopolist

- First order condition:

$$\frac{dPR}{dQ} = \frac{dTR}{dQ} - \frac{dTC}{dQ} = MR - MC = 0$$

that is:  $MR = MC$

- Second order condition:

$$\frac{d^2PR}{dQ^2} = \frac{d^2TR}{dQ^2} - \frac{d^2TC}{dQ^2} \ll 0$$

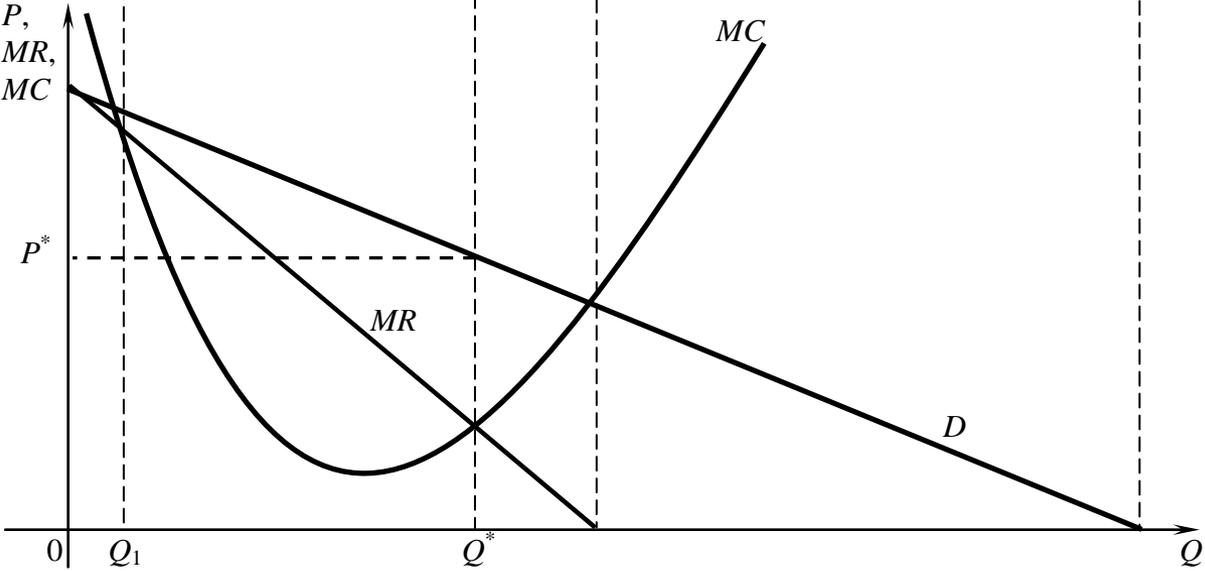
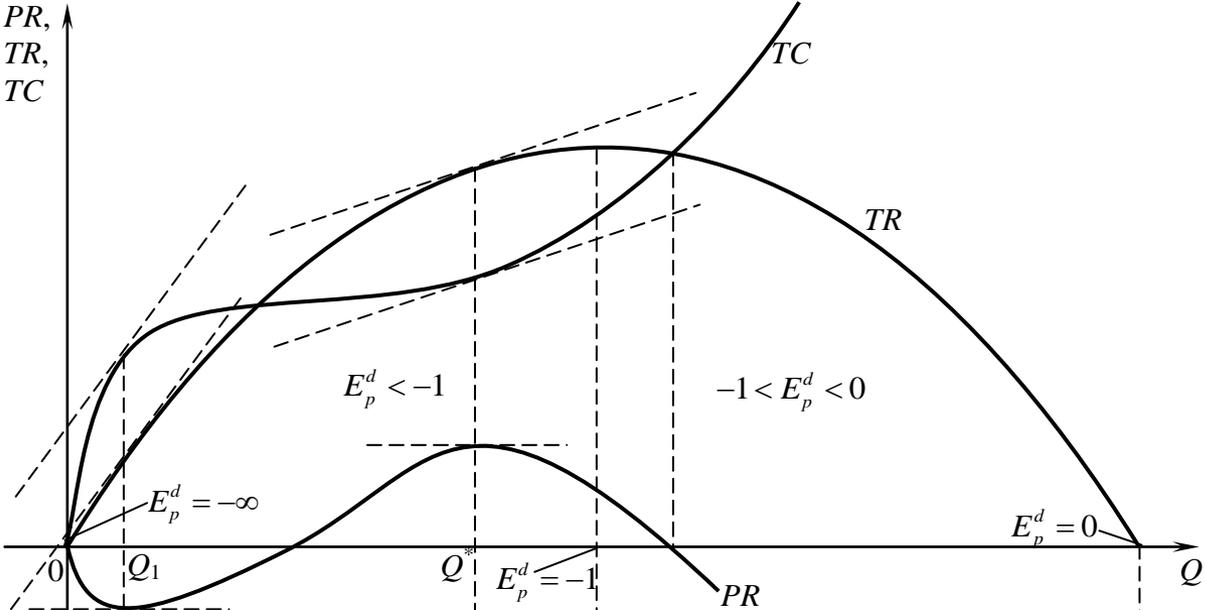
that is:  $MR' \ll MC'$

# Profit-maximizing Output for a Monopolist

$$\begin{aligned}
 MR &= \frac{dTR}{dQ} = \frac{d}{dQ} (p(Q)Q) = \frac{dp(Q)}{dQ} Q + p(Q) = p(Q) \cdot \left( \frac{dp(Q)}{dQ} \cdot \frac{Q}{p(Q)} + 1 \right) \\
 &= p \cdot \left( \frac{1}{\frac{dQ(p)}{dp} \cdot \frac{p}{Q(p)}} + 1 \right) = p \cdot \left( 1 + \frac{1}{E_p^d} \right) = MC.
 \end{aligned}$$

- Recollect: for a price-taker:  $\frac{dp}{dQ} = 0$ , so  $MR=P$ .
- A monopolist faces a downward-sloping demand curve, thus,  $MR(Q) \neq P(Q)$ .
- Marginal revenue is smaller than the price:  $MR(Q) < P(Q)$ , since  $\frac{dp}{dQ} < 0$ : monopolist can sell an additional unit only by cutting price for all units.
- $MR > 0$ , so  $E_p^d < -1$ , i.e. monopolist never produces on the inelastic part of the demand curve.

# Profit maximization by a monopoly



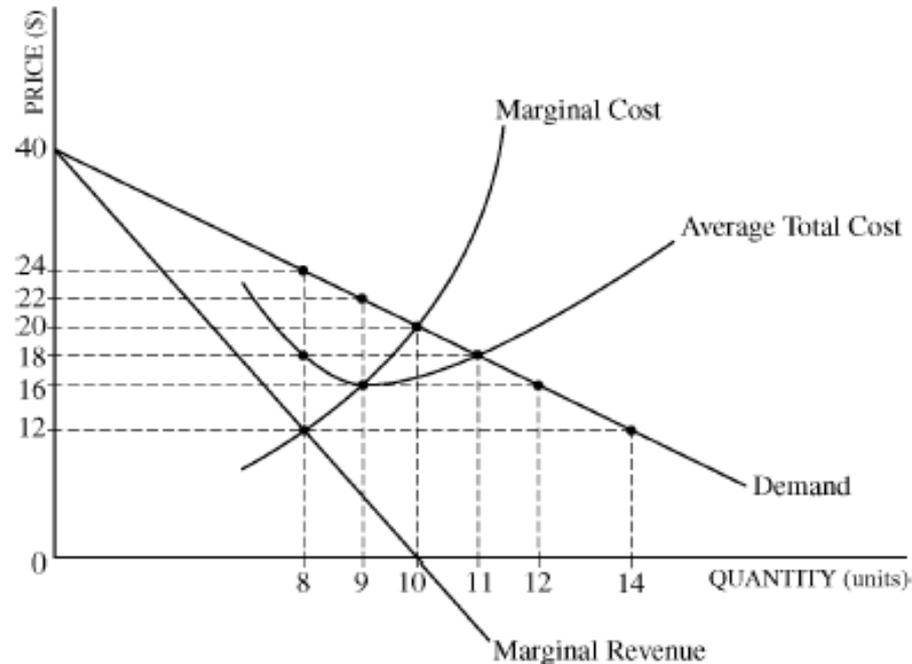
# Example: APT 1999

## Question 3

- a. Using one graph for a monopoly firm and one for a perfectly competitive firm, draw and label the demand curve and the marginal revenue curve for each of these firms.
- b. For the perfectly competitive (a price taker) firm, explain why the relationship between demand and marginal revenue exists.
- c. For the monopoly firm, explain why the relationship between demand and marginal revenue exists.

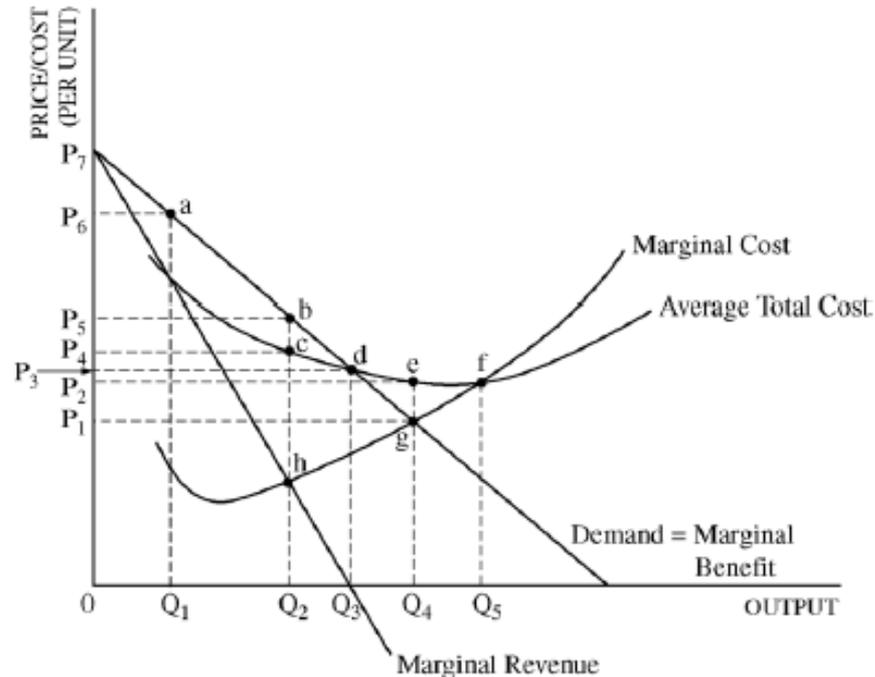
# Example: APT 2011

1. A monopolist's demand, marginal revenue, and cost curves are shown in the diagram below.



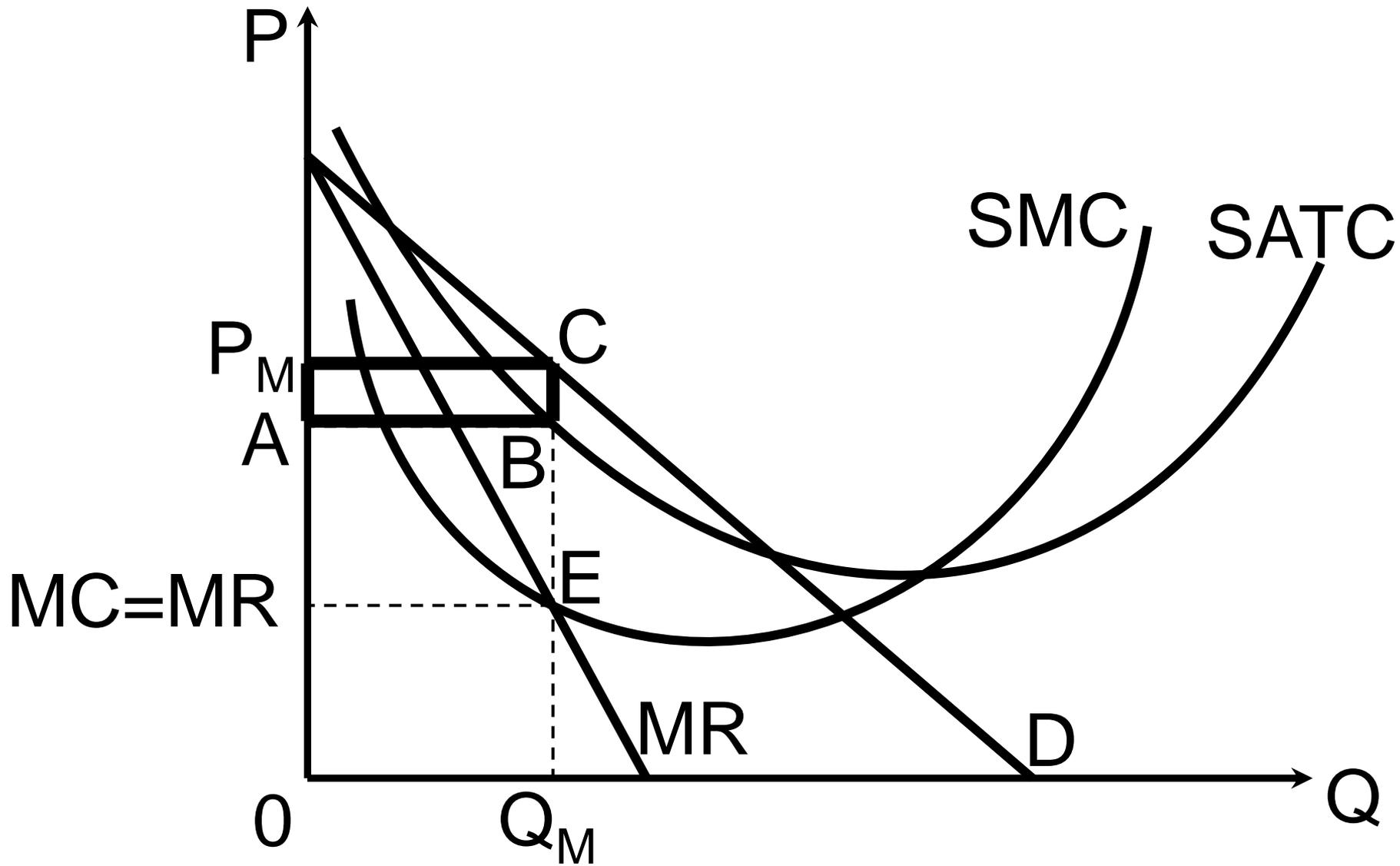
- Assume that the monopolist wants to maximize profit. Using the labeling on the graph, indicate the monopolist's price.
- When the output is 8 units, what is the profit per unit?
- Assume that the monopolist is maximizing profit. Is allocative efficiency achieved? Explain.
- Between the prices of \$16 and \$18, is the monopolist in the elastic, inelastic, or unit elastic portion of its demand curve? Explain.
- Assume that regulators set an output of 11 units.
  - Is the monopolist earning positive economic profit? Explain.
  - Is the monopolist earning positive accounting profit?

# Example: APT 2008 (Form B)

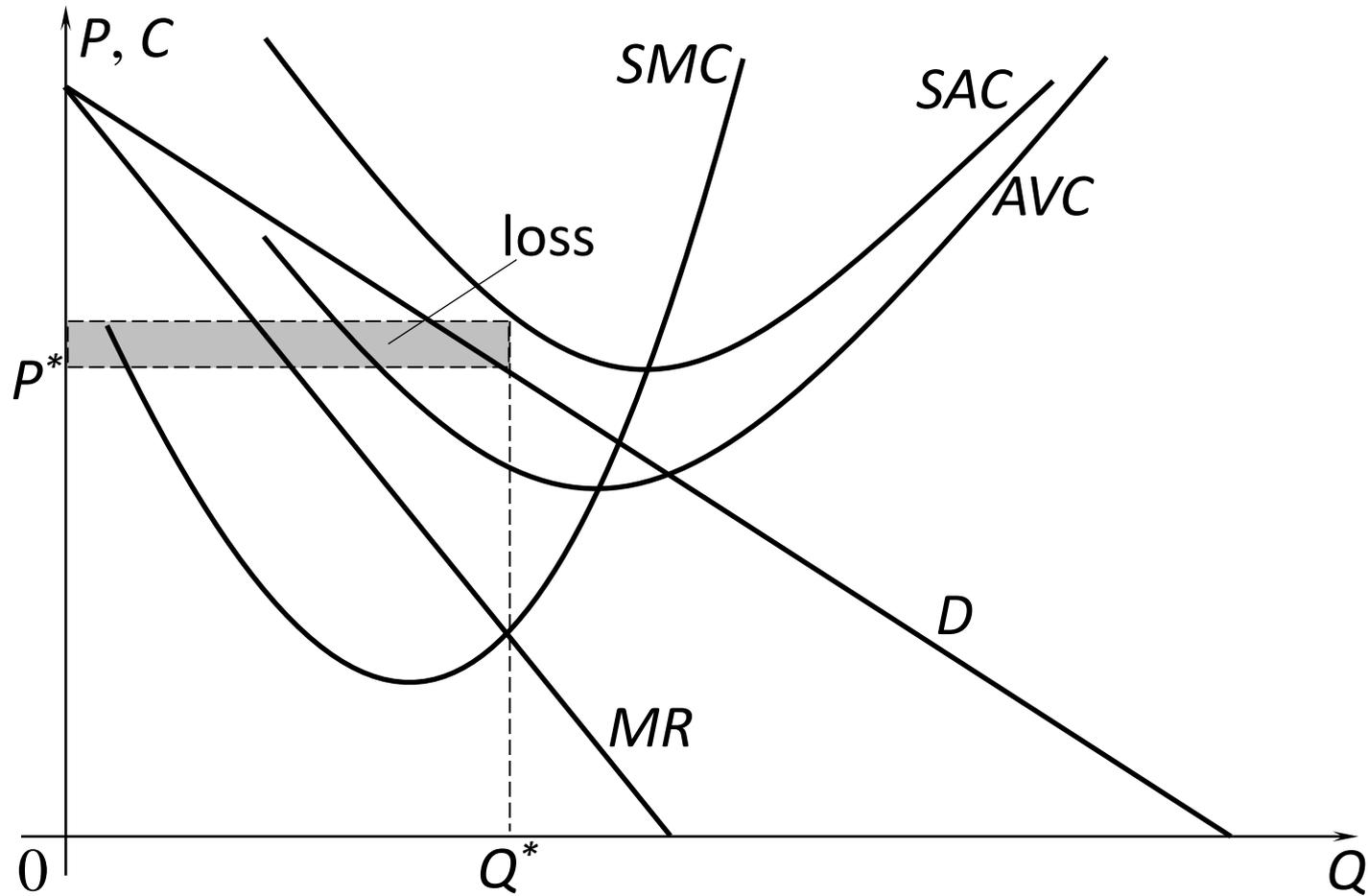


1. The graph above shows the demand and cost curves of a firm that does not price discriminate.
  - (a) Suppose the firm produces at the profit-maximizing output. Using the labeling on the graph, identify each of the following.
    - (i) Level of output. Explain.
    - (ii) Price
  - (b) Suppose the firm produces at the revenue-maximizing output. Using the labeling on the graph, identify each of the following.
    - (i) Level of output. Explain.
    - (ii) Price

# Profit maximization by a monopoly in the short run: positive economic profit



# Profit maximization by a monopoly in the short run: economic loss



# Example: APT 2006 (Form B)

1. Assume that Clark Electronics has a monopoly in the production and sale of a new device for detecting and destroying a computer virus. Clark Electronics currently incurs short-run losses, but it continues to operate.
  - (a) What must be true for Clark to continue to operate in the short run?
  - (b) Draw a correctly labeled graph, and show each of the following for Clark.
    - (i) The profit-maximizing price and output
    - (ii) Area of loss
  - (c) Assume Clark is maximizing profit. What will happen to its total revenue if Clark raises its price? Explain.
  - (d) If demand for the new device increases, explain what will happen to each of the following in the short run.
    - (i) Profit-maximizing output
    - (ii) Total cost

# Measuring monopoly power: Lerner index

$$L = \frac{p - MC}{p} = \frac{p - MR}{p} = \frac{p - p \left( 1 + \frac{1}{E_p^d} \right)}{p} = -\frac{1}{E_p^d}$$

# Example: APT 1995

## Question 3

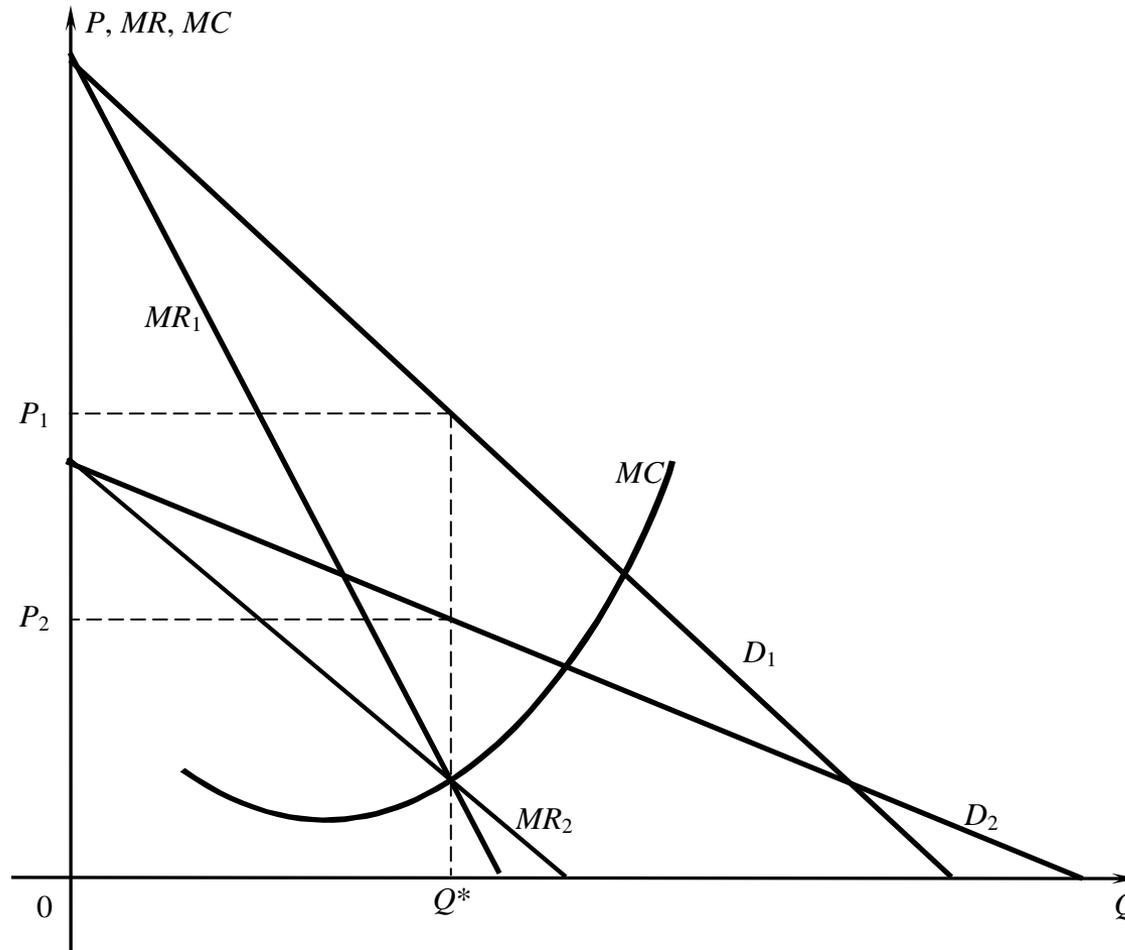
(b) A firm's market power is sometimes measured by using the following formula

$$\frac{(P-MC)}{P}$$

where  $P$  is price and  $MC$  is marginal cost at the profit-maximizing output level. Some economists claim the larger the value of the index, the greater the firm's market power.

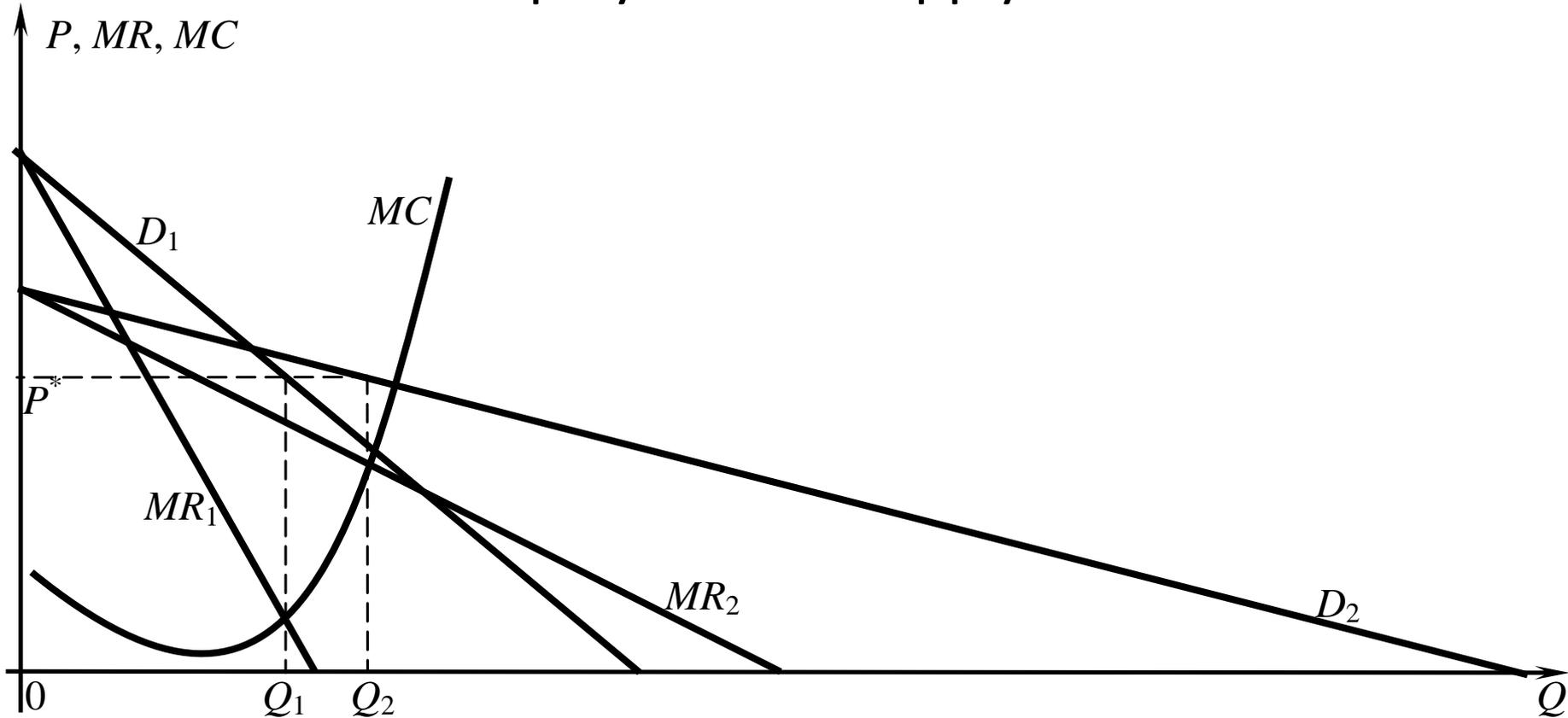
- (i) Explain why this index is always positive for an imperfectly competitive market.
- (ii) Using the formula, calculate the market power of any perfectly competitive firm.

# A monopoly has no supply curve



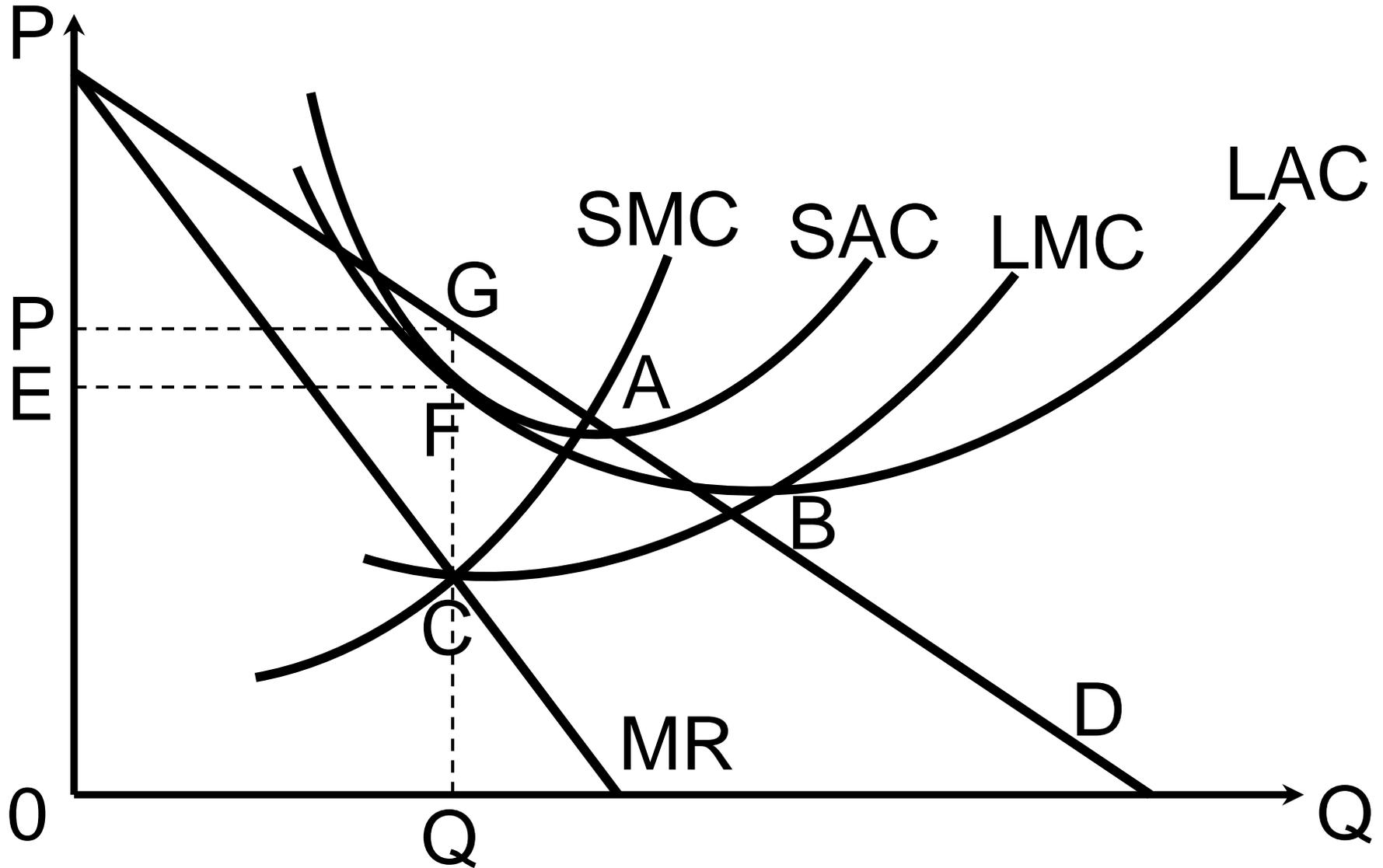
One and the same monopolistic output may correspond to different price levels due to changes in market demand . There is no functional correspondence between quantity supplied and market price under monopoly.

## A monopoly has no supply curve

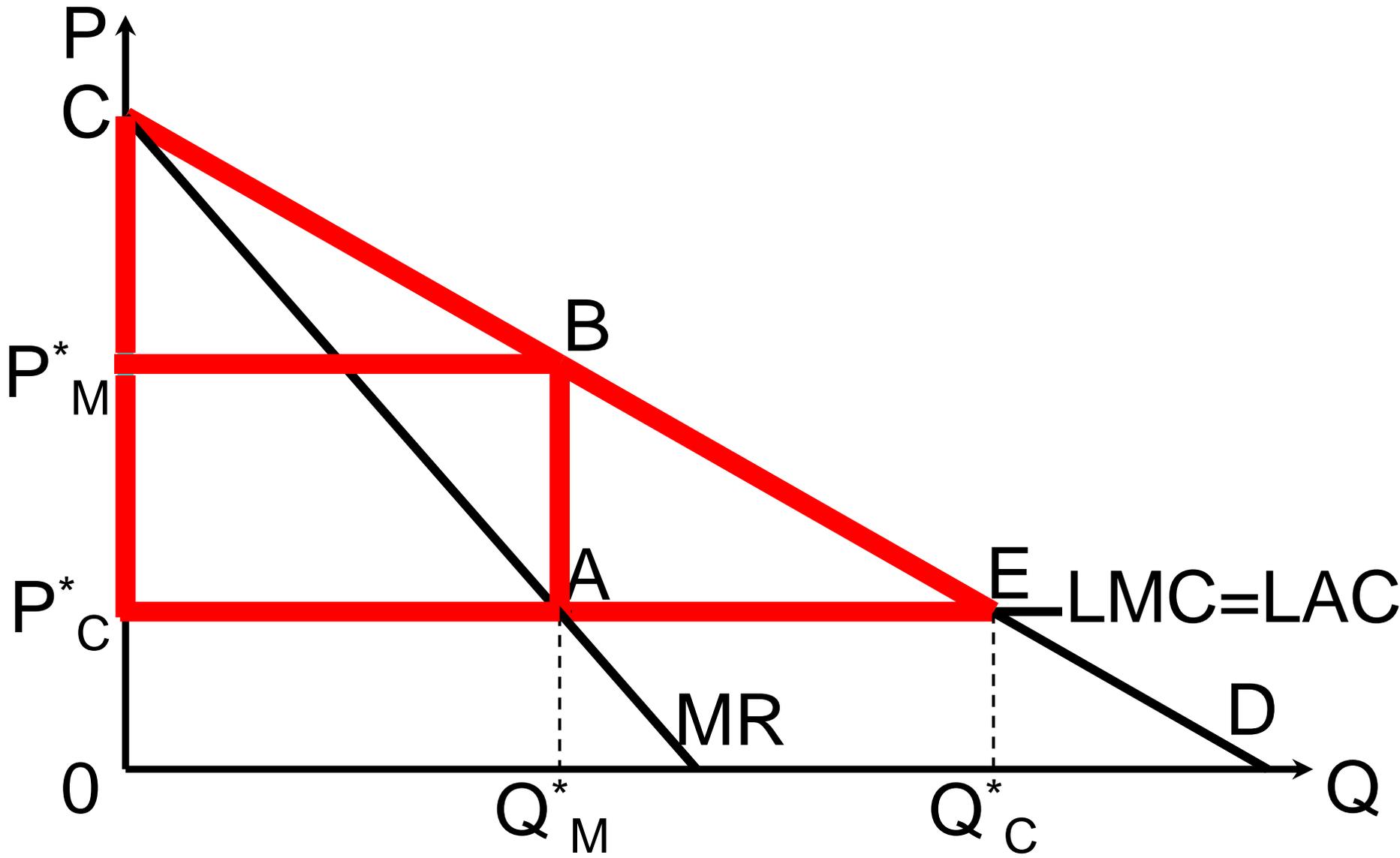


One and the same price level may correspond to different quantities supplied by a monopoly due to changes in market demand. There is no functional correspondence between market price and optimal output under monopoly.

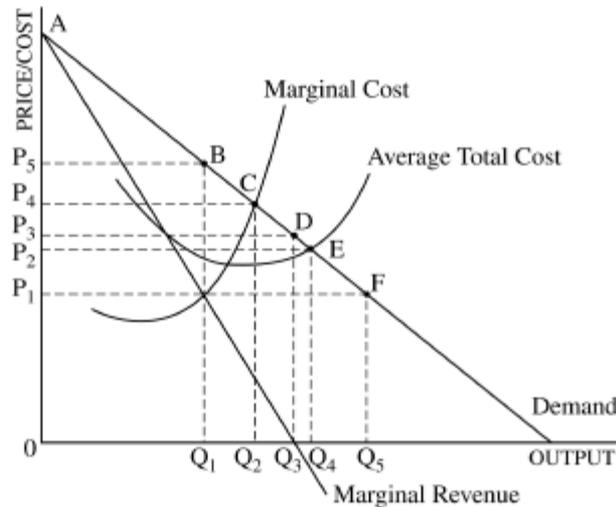
# Profit maximization by a monopoly in the long run



# Monopoly and efficiency: dead weight loss



# Example: APT 2000

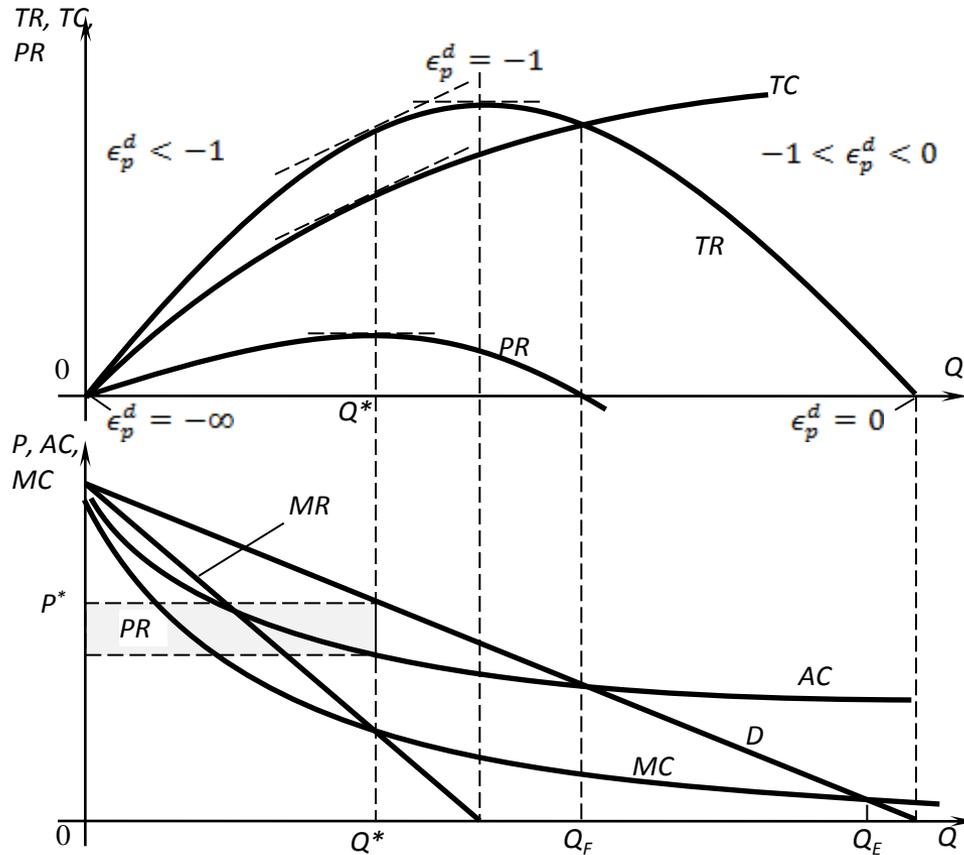


1. The diagram above shows the cost and revenue curves for a monopoly.
  - (a) How does a monopolist determine its profit-maximizing level of output and price?
  - (b) Using the information in the graph, identify each of the following for the monopolist.
    - (i) The profit-maximizing level of output and price
    - (ii) The line segment of the demand curve that is elastic
  - (c) Suppose that the industry depicted in the graph became perfectly competitive without changing the demand or cost curves. Identify the equilibrium price and output that would prevail in the perfectly competitive market.
  - (d) Using the information in the graph, identify the area of consumer surplus for each of the following.
    - (i) The profit-maximizing monopoly
    - (ii) The perfectly competitive industry
  - (e) Define allocative efficiency.
  - (f) To be allocatively efficient, what level of output should the monopolist produce?

# Example: APT 2003 (Form B)

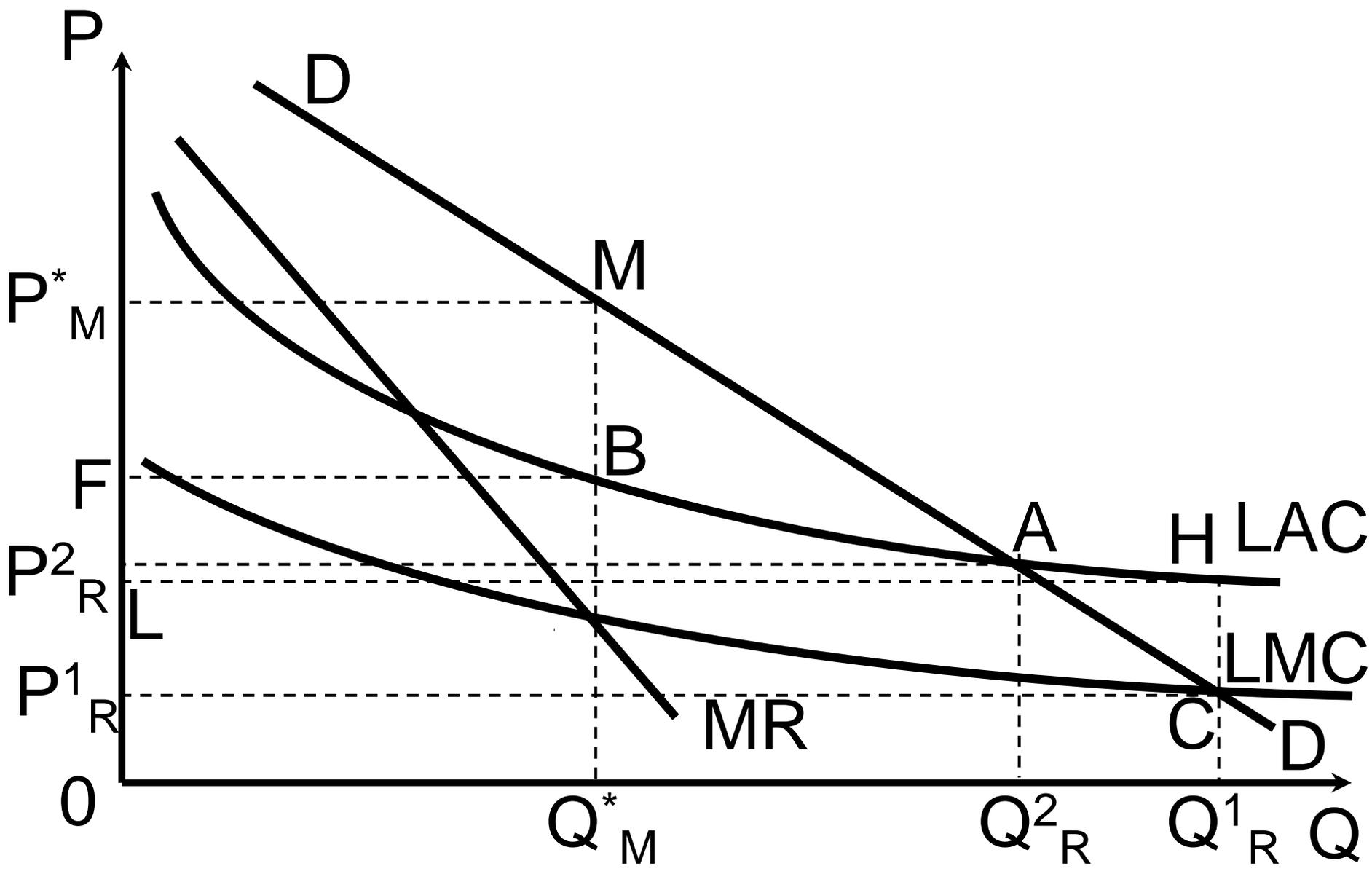
1. Market structures differ from one another in many respects. Consider two profit-maximizing firms that earn short-run economic profits. One is a perfectly competitive firm and the other is a monopoly.
  - (a) For each firm, draw a correctly labeled graph showing the following.
    - (i) Price
    - (ii) Quantity of output
    - (iii) Area of economic profits
  - (b) For each firm, explain the relationship between price and marginal revenue.
  - (c) For each firm, explain how the economic profits would most likely change in the long run.
  - (d) Label the area that represents the deadweight loss on the graph for the monopoly firm drawn in (a). Explain what this deadweight loss represents.

# Unregulated natural monopoly



Economies of scale over the entire range of output

# Natural monopoly: dilemma of regulation

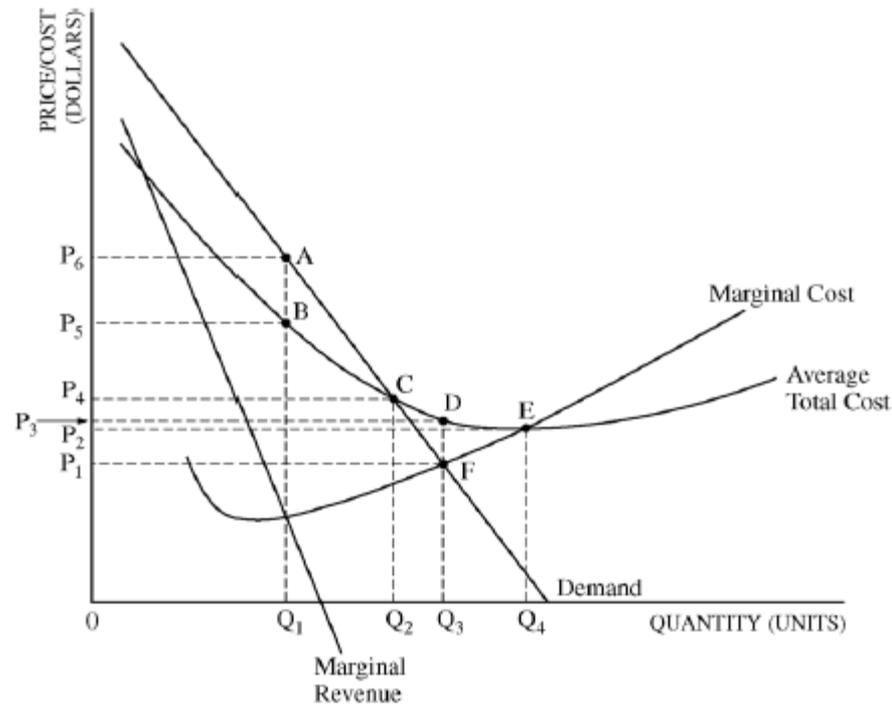


# Example: APT 2008

3. Social efficiency is affected by government policy and the structure of markets.

(a) For a competitive market for which there is a binding (effective) price ceiling, draw a correctly labeled graph and label the price ceiling " $P_c$ ", the quantity sold " $Q_A$ ", and the socially efficient output " $Q_B$ ".

(b) The graph below shows a natural monopoly.



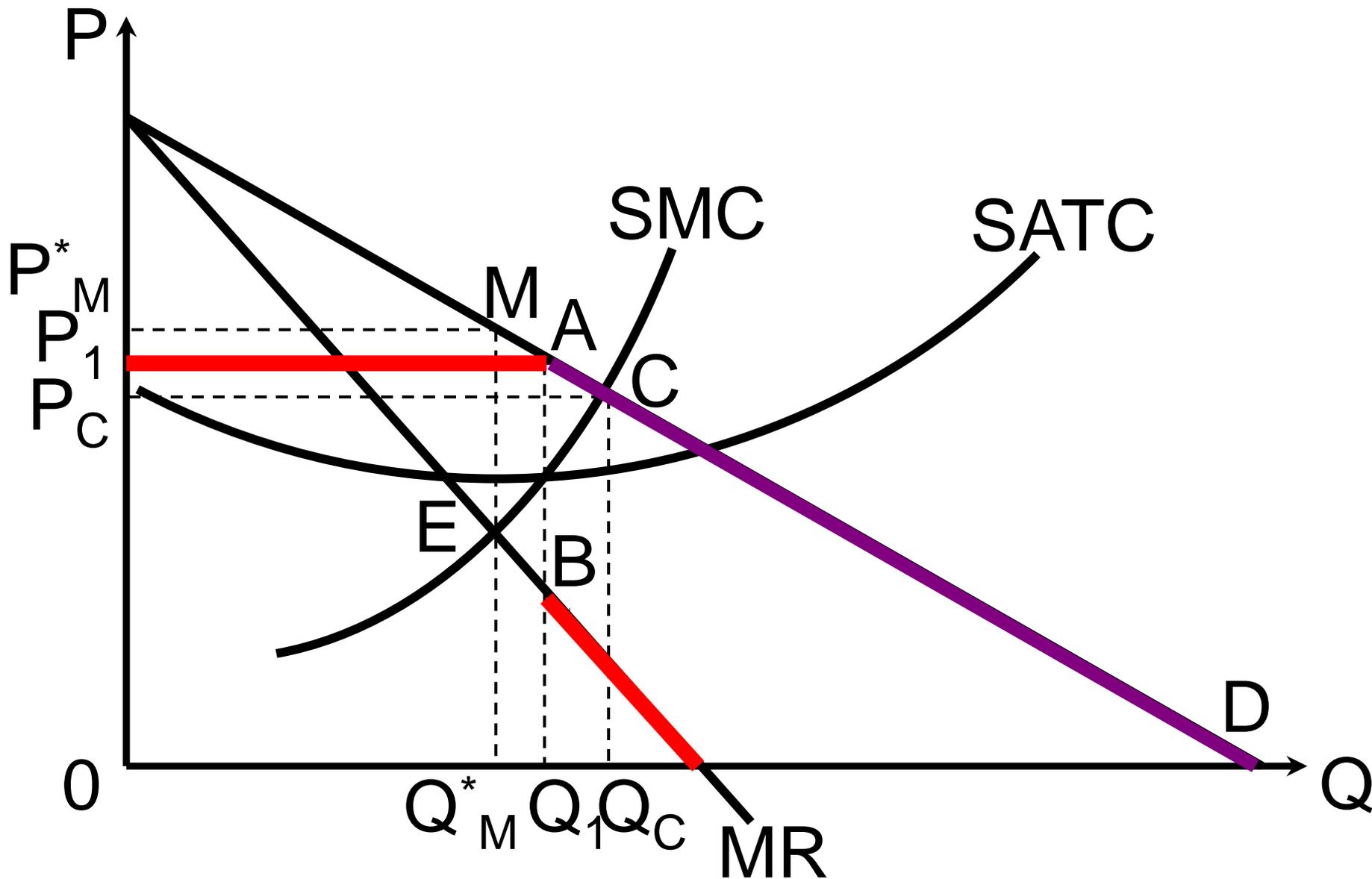
(i) Using the labeling in the graph, identify each of the following.

(1) The profit-maximizing output

(2) The socially efficient output

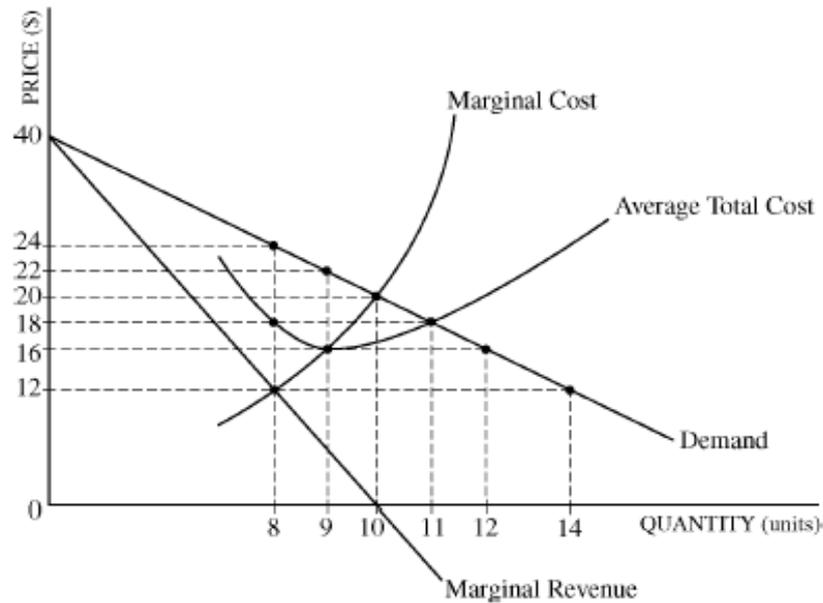
(ii) At the socially efficient output, is the monopoly making a profit or incurring a loss? Using the labeling on the graph, identify the area of profit or loss.

# Monopoly and efficiency: price ceiling



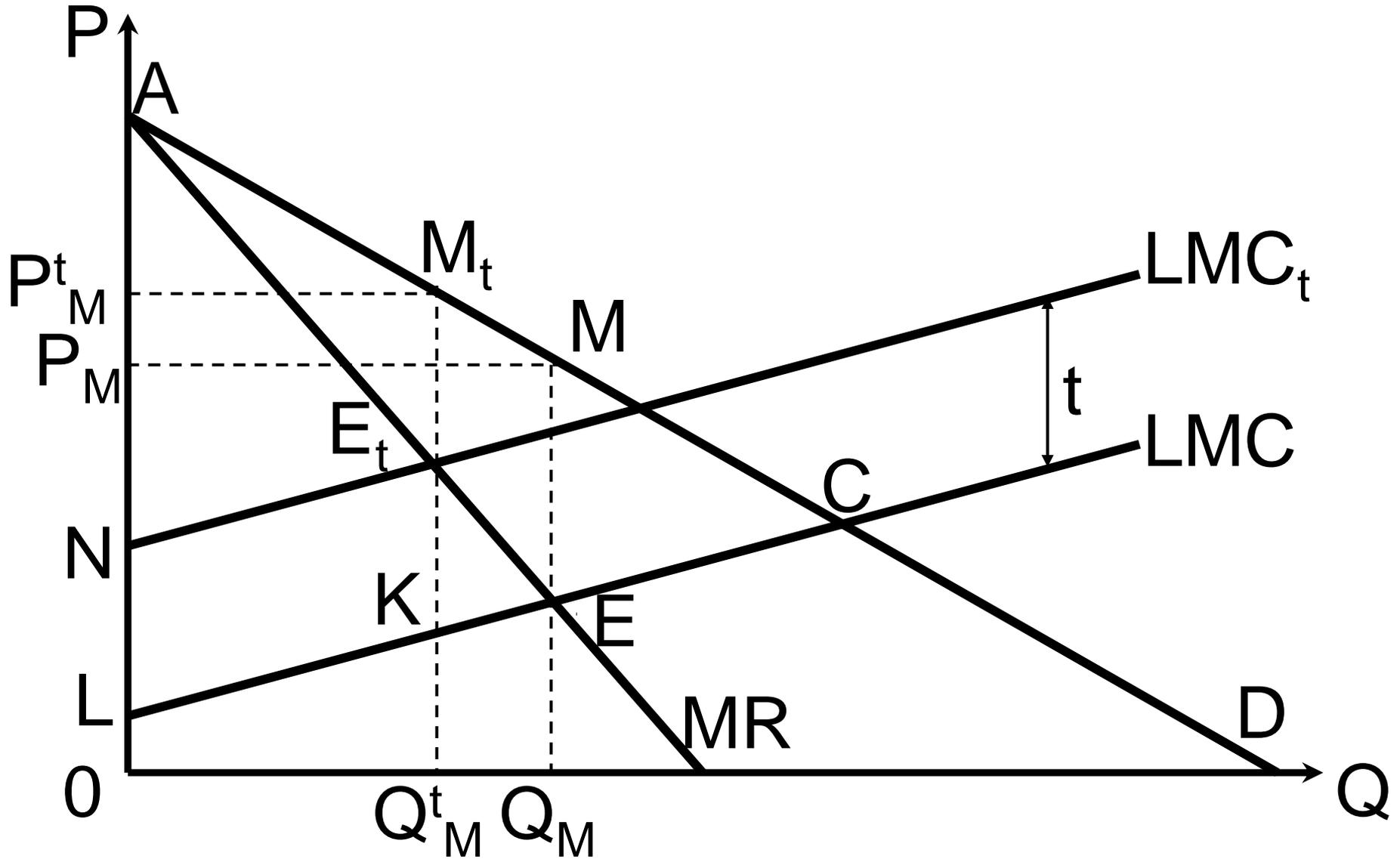
# Example: APT 2011 (continued)

1. A monopolist's demand, marginal revenue, and cost curves are shown in the diagram below.



- Assume that the monopolist wants to maximize profit. Using the labeling on the graph, indicate the monopolist's price.
- When the output is 8 units, what is the profit per unit?
- Assume that the monopolist is maximizing profit. Is allocative efficiency achieved? Explain.
- Between the prices of \$16 and \$18, is the monopolist in the elastic, inelastic, or unit elastic portion of its demand curve? Explain.
- Assume that regulators set an output of 11 units.
  - Is the monopolist earning positive economic profit? Explain.
  - Is the monopolist earning positive accounting profit?
- Assume instead that regulators impose a price ceiling of \$22.
  - What is the marginal revenue for the eighth unit?
  - What quantity will be produced?

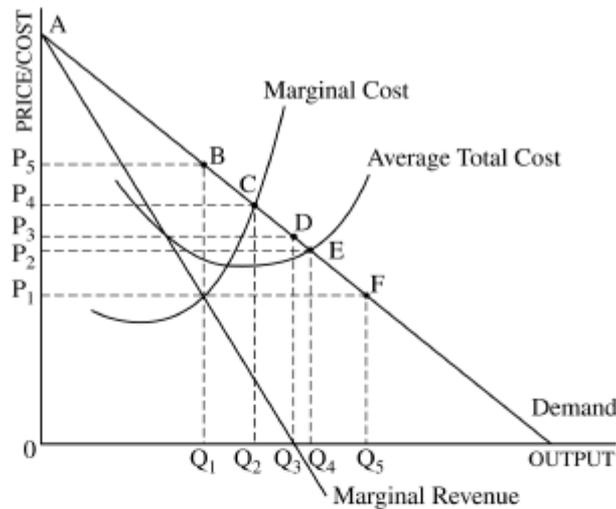
# Monopoly and efficiency: per-unit tax



# Example: APT 2007

1. A patent gives inventors the exclusive right to produce and market a product for a period of time. GCR Company is a profit-maximizing firm. It has a patent for a unique antispyware computer program called Aspy.
  - (a) Assume that GCR is making economic profit. Draw a correctly labeled graph and show the profit-maximizing price and quantity.
  - (b) Assume that the government imposes a lump-sum tax on GCR.
    - (i) What will happen to output and market price? Explain.
    - (ii) What will happen to GCR's profits?
  - (c) Assume instead that the government grants a per-unit subsidy to GCR for Aspy.
    - (i) What will happen to output and market price? Explain.
    - (ii) What will happen to GCR's profits?
  - (d) Now assume that GCR's patent on Aspy expires. What will happen to GCR's economic profits in the long run? Explain.

# Example: APT 2000



1. The diagram above shows the cost and revenue curves for a monopoly.
  - (a) How does a monopolist determine its profit-maximizing level of output and price?
  - (b) Using the information in the graph, identify each of the following for the monopolist.
    - (i) The profit-maximizing level of output and price
    - (ii) The line segment of the demand curve that is elastic
  - (c) Suppose that the industry depicted in the graph became perfectly competitive without changing the demand or cost curves. Identify the equilibrium price and output that would prevail in the perfectly competitive market.
  - (d) Using the information in the graph, identify the area of consumer surplus for each of the following.
    - (i) The profit-maximizing monopoly
    - (ii) The perfectly competitive industry
  - (e) Define allocative efficiency.
  - (f) To be allocatively efficient, what level of output should the monopolist produce?
  - (g) Should the government use a per-unit tax or a per-unit subsidy to lead the monopolist to produce the allocatively efficient level of output? Explain how this tax or subsidy would achieve the allocatively efficient level of output.

# Price discrimination

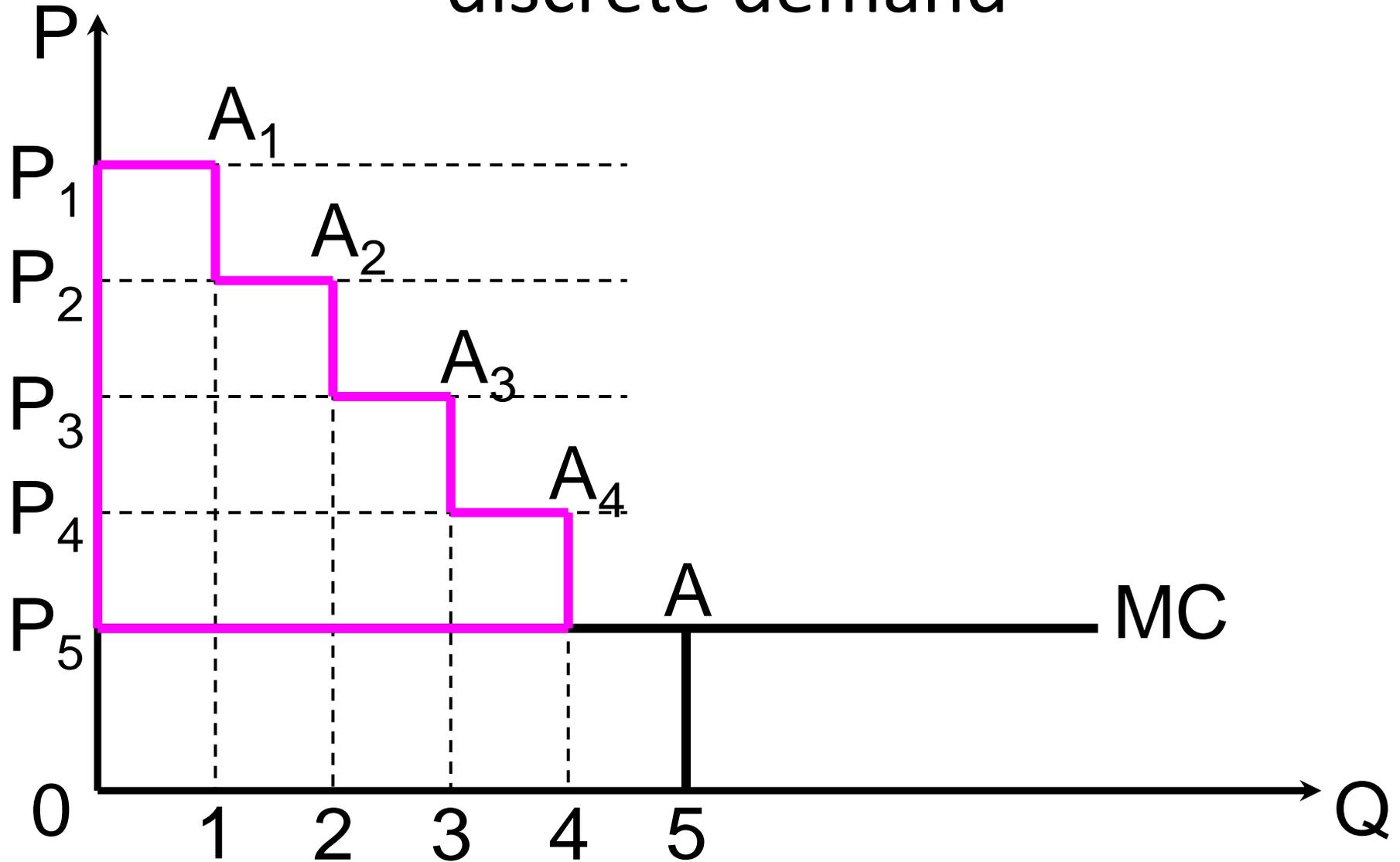
Different customers are charged different prices for one and the same good produced at the same cost

“No resale” condition

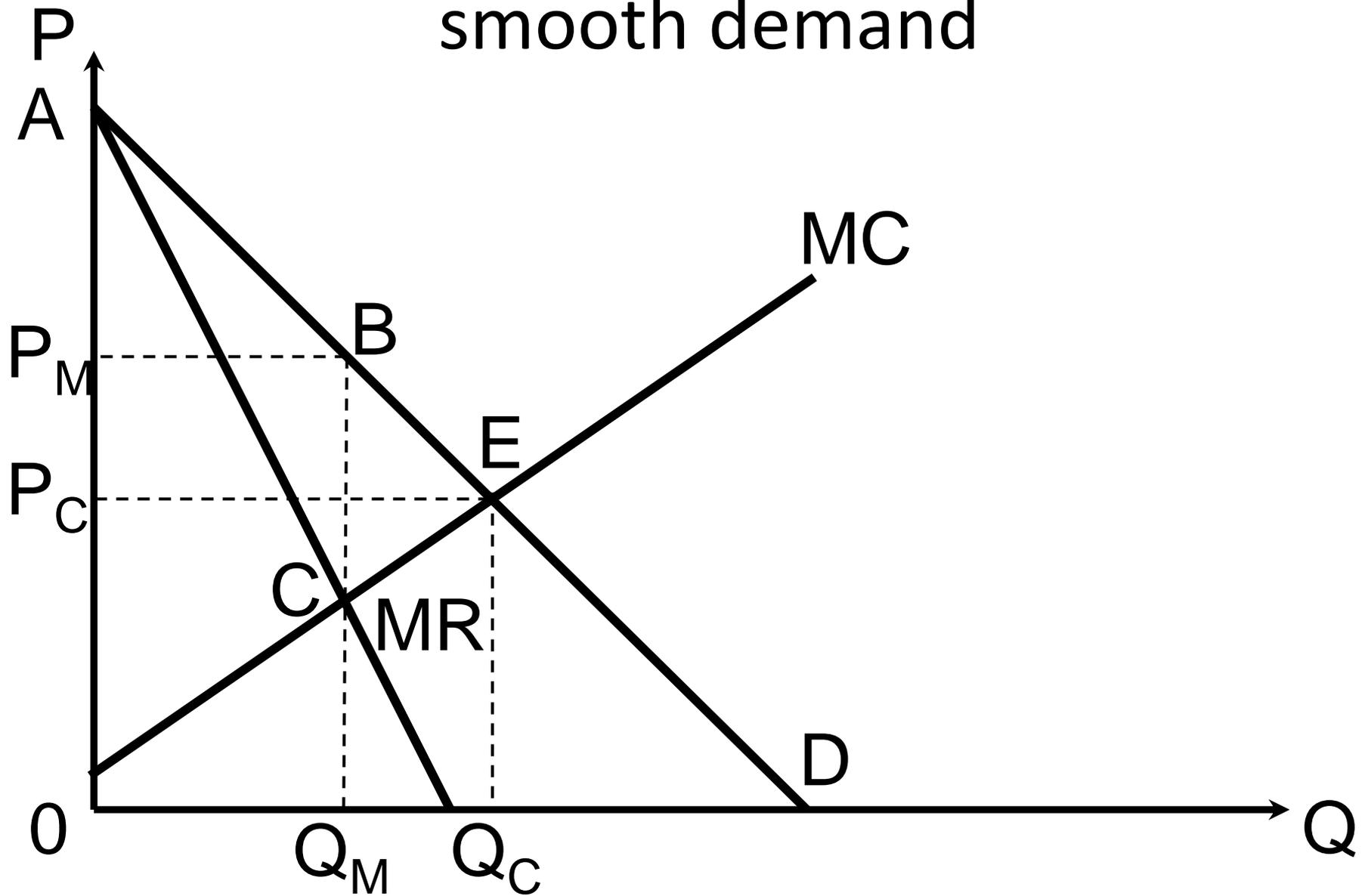
Perfect (first degree) price discrimination: each customer is charged her reservation price

Reservation price is the highest price a customer is ready to pay for a good

# Perfect price discrimination: discrete demand

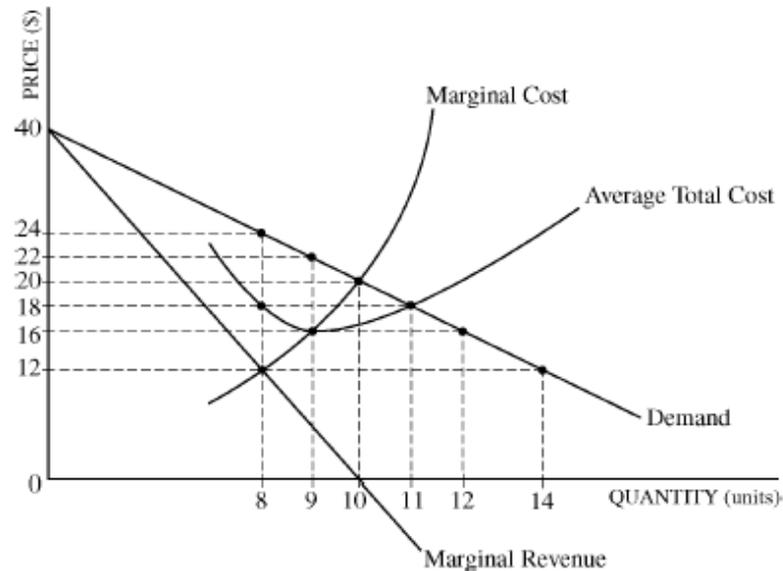


# Perfect price discrimination: smooth demand



# Example: APT 2011 (continued)

1. A monopolist's demand, marginal revenue, and cost curves are shown in the diagram below.



- Assume that the monopolist wants to maximize profit. Using the labeling on the graph, indicate the monopolist's price.
- When the output is 8 units, what is the profit per unit?
- Assume that the monopolist is maximizing profit. Is allocative efficiency achieved? Explain.
- Between the prices of \$16 and \$18, is the monopolist in the elastic, inelastic, or unit elastic portion of its demand curve? Explain.
- Assume that regulators set an output of 11 units.
  - Is the monopolist earning positive economic profit? Explain.
  - Is the monopolist earning positive accounting profit?
- Assume instead that regulators impose a price ceiling of \$22.
  - What is the marginal revenue for the eighth unit?
  - What quantity will be produced?
- Assume instead that the monopolist practices perfect price discrimination (also called first-degree price discrimination).
  - What quantity will be produced?
  - What will be the value of the consumer surplus?