After Midterm
Monopoly
(Chapter 11: 11.1-11.6)

Monopoly

Definition: A **Monopoly Market** consists of a single seller facing many buyers.

The monopolist's profit maximization problem:

$$\textbf{Max } \pi(Q) = TR(Q) - TC(Q)$$

where: TR(Q) = QP(Q) and
P(Q) is the *(inverse)* market demand curve.

The monopolist's profit maximization condition:

$$\Delta TR(Q)/\Delta Q = \Delta TC(Q)/\Delta Q \quad \textbf{OR} \quad MR(Q) = MC(Q)$$

Monopoly vs Perfect Competition

In perfect competition, there are infinitely many buyers and sellers, selling homogeneous products.

As a result, **perfectly competitive firms are price takers**: they take price as given, and face a perfectly elastic demand curve.

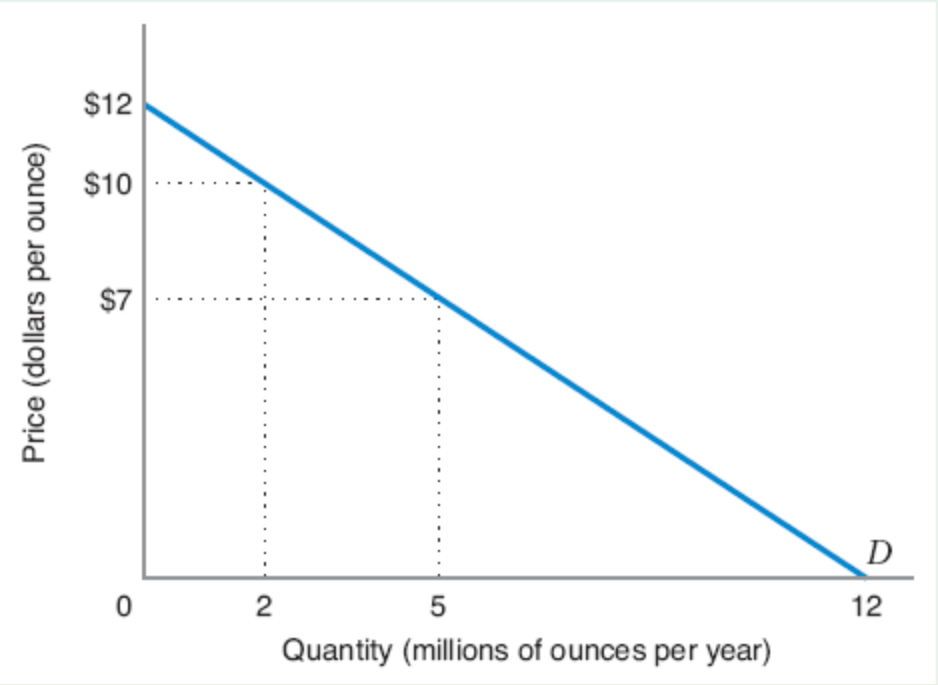
In contrast, **a monopolist is a price maker**. It sets the market price to maximize its profit.

However, we often state the monopolist's profit maximization problem in terms of setting quantity rather than price.

This is because TR(Q) and TC(Q) are functions of Quantity.

Profit Maximization by a Monopolist

The Monopolist's Demand Curve is downward-sloping: the higher P, the lower Q, and vice versa.



- Along the demand curve, different revenues for different quantities
- Profit maximization problem is **the optimal trade-off between volume** (number of units sold) **and margin** (the differential between price).

Profit Maximization by a Monopolist

- Demand Curve: $P(Q) = 12 - Q$
- Total Revenue: $TR(Q) = Q \times P(Q) = 12Q - Q^2$
- Total Cost: $TC(Q) = \frac{1}{2}Q^2$
- **Profit-Maximization: MR(Q*) = MC(Q*)**

Profit Maximization by a Monopolist

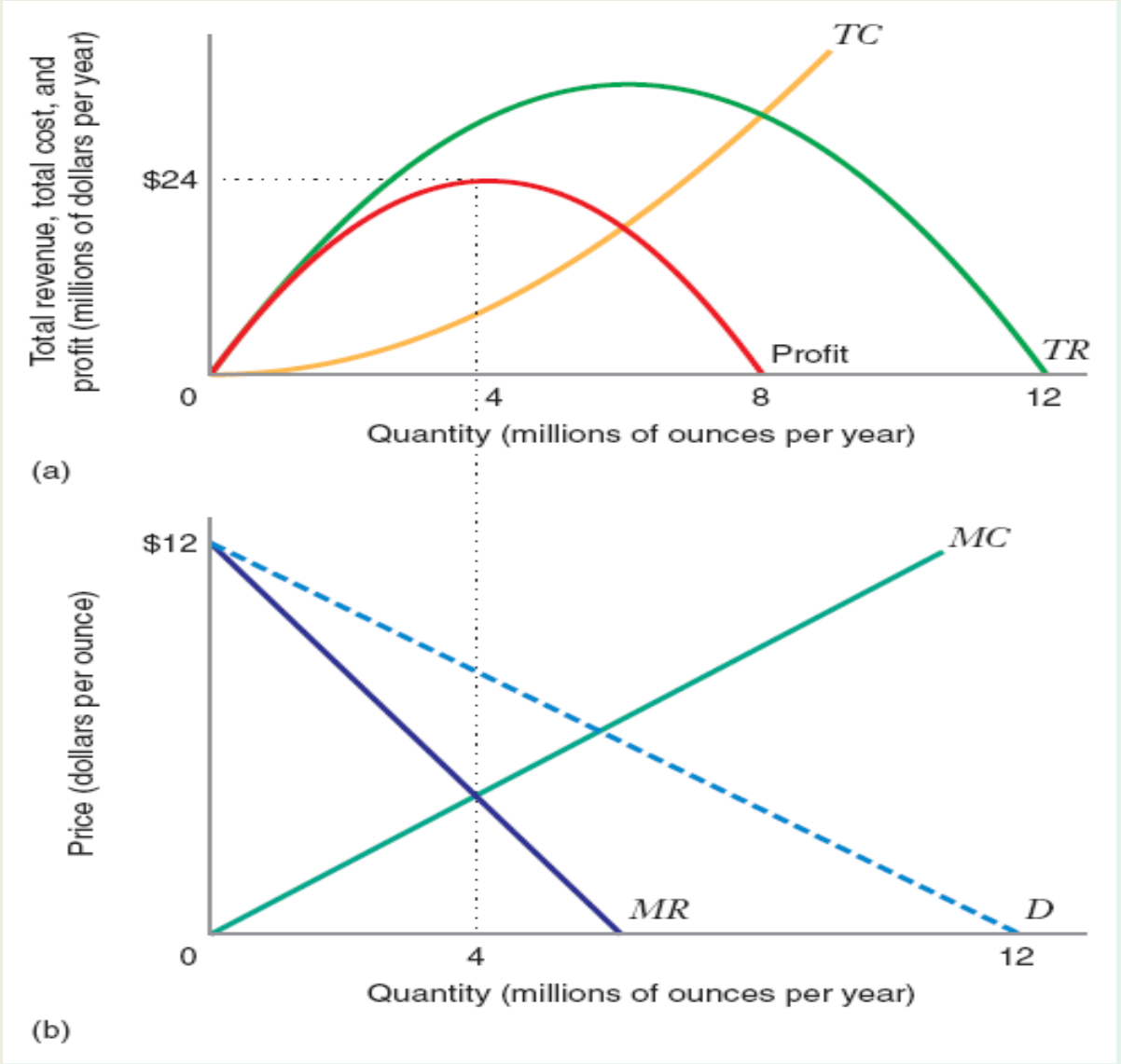
Given the inverse demand and MC, what is the profit maximizing Q and P for the monopolist?

$P = 12 - Q$ $MC = Q$ $MR = 12 - 2Q$

Setting MC = MR ; $12 - 2Q = Q$

$Q^* = 4$ $P^* = 12 - 4 = 8$

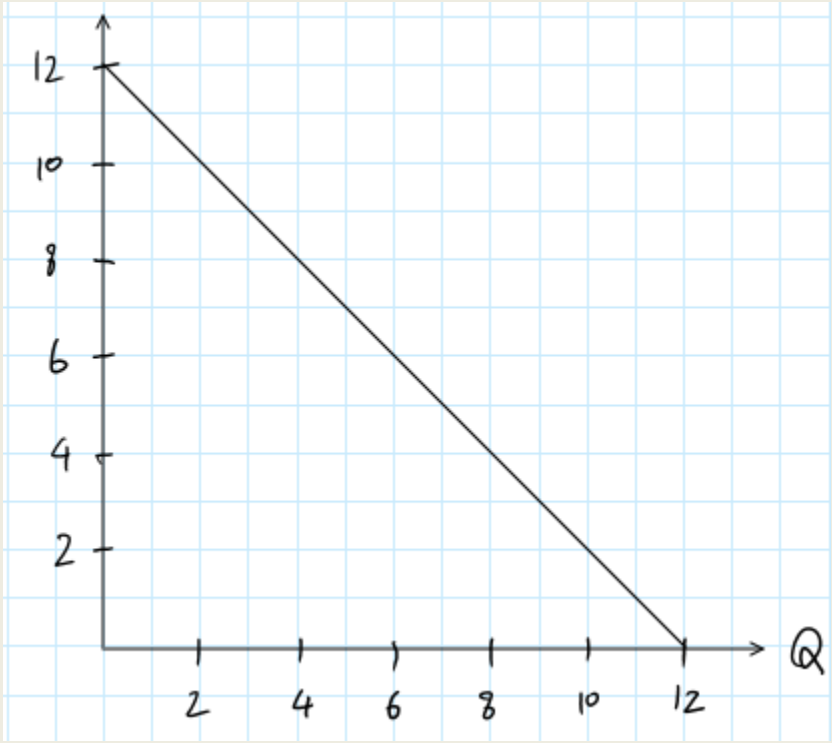
Profit Maximization by a Monopolist



Profit Maximization by a Monopolist

- If MR > MC,
- If MR < MC,
- MR = MC,

A Closer Look at MR



The extra 3m ounces is called **Marginal Units.**
The prior 2m ounces is called **Inframarginal Units.**

- To sell more units, a monopolist has to lower the price.
- At the lower P, **the increase in TR** is Area…….
- **The TR sacrificed** is Area…….
- ΔTR = ……..

Marginal Revenue

- Area C = price x change in quantity = $P*\Delta Q$
- Area B = - quantity x change in price = $-\Delta P*Q$
- Change in TR = $\Delta TR = P*\Delta Q - (-\Delta P*Q)$

- So MR =

where $\Delta P/\Delta Q$ = slope of the inverse demand curve.

Marginal Revenue

Marginal revenue has two parts:

- P: increase in TR due to higher Q, i.e., the marginal units.
- $(\Delta P/\Delta Q)*Q$: decrease in TR due to lower P of the inframarginal units.

Since $(\Delta P/\Delta Q)*Q < 0$, then **MR is less than the price** for any Q greater than 0, i.e., MR(Q) lies below P(Q).

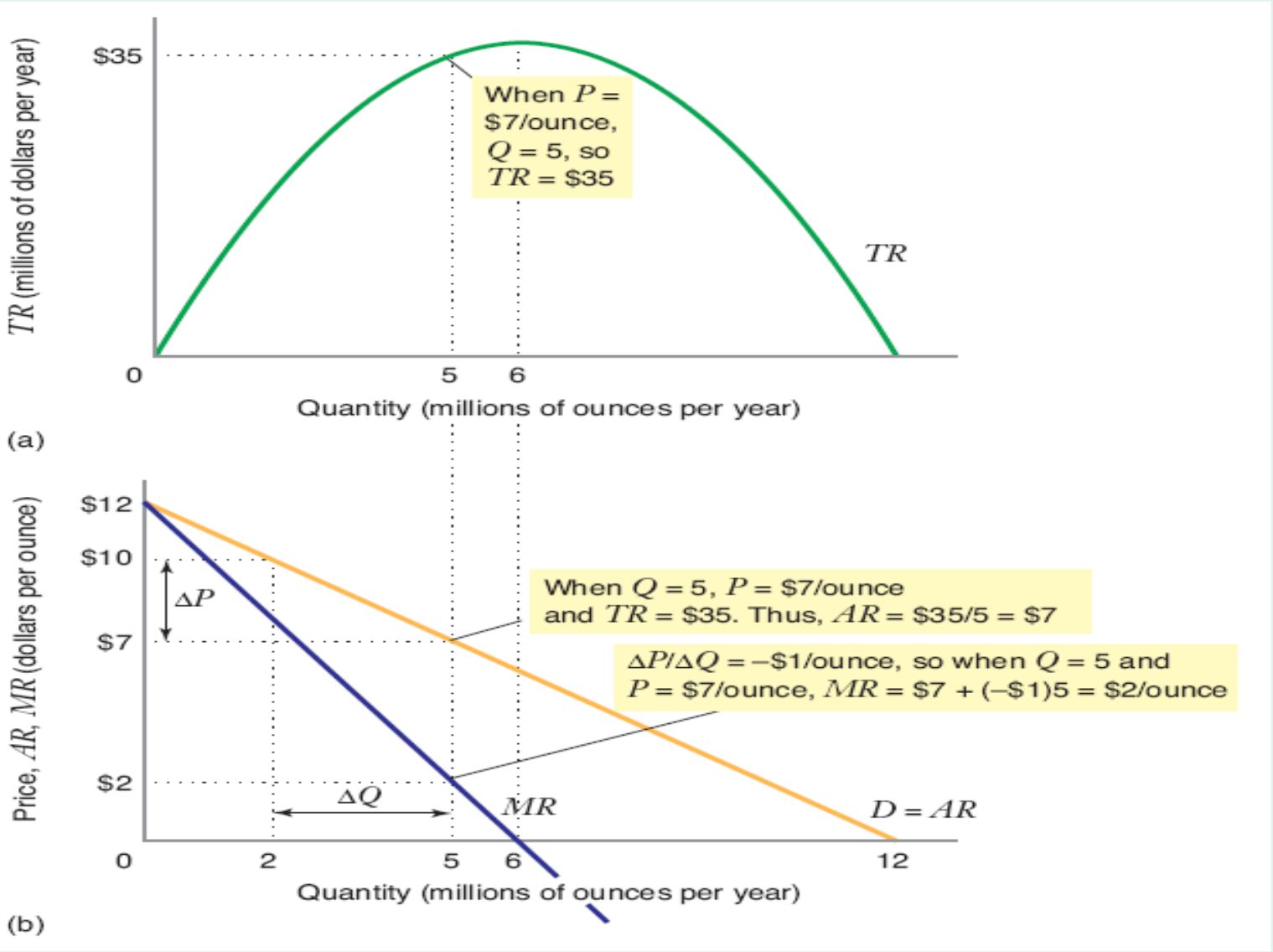
Average Revenue

Since $$AR = \frac{TR}{Q} = \frac{PxQ}{Q} = P$$

the monopolist's AR curve coincides with the market inverse demand curve:

$$AR(Q) = P(Q)$$

Total, Average, and Marginal Revenue



MR and AR

When P decreases by $3 per ounce (from $10 to $7),
Q increases by 3 million ounces (from 2 million to 5 million).

$$\frac{\Delta P}{\Delta Q} =$$

$$TR = P \times Q = 7 \times 5 = \_\_\_\_ \; million \; per \; year$$

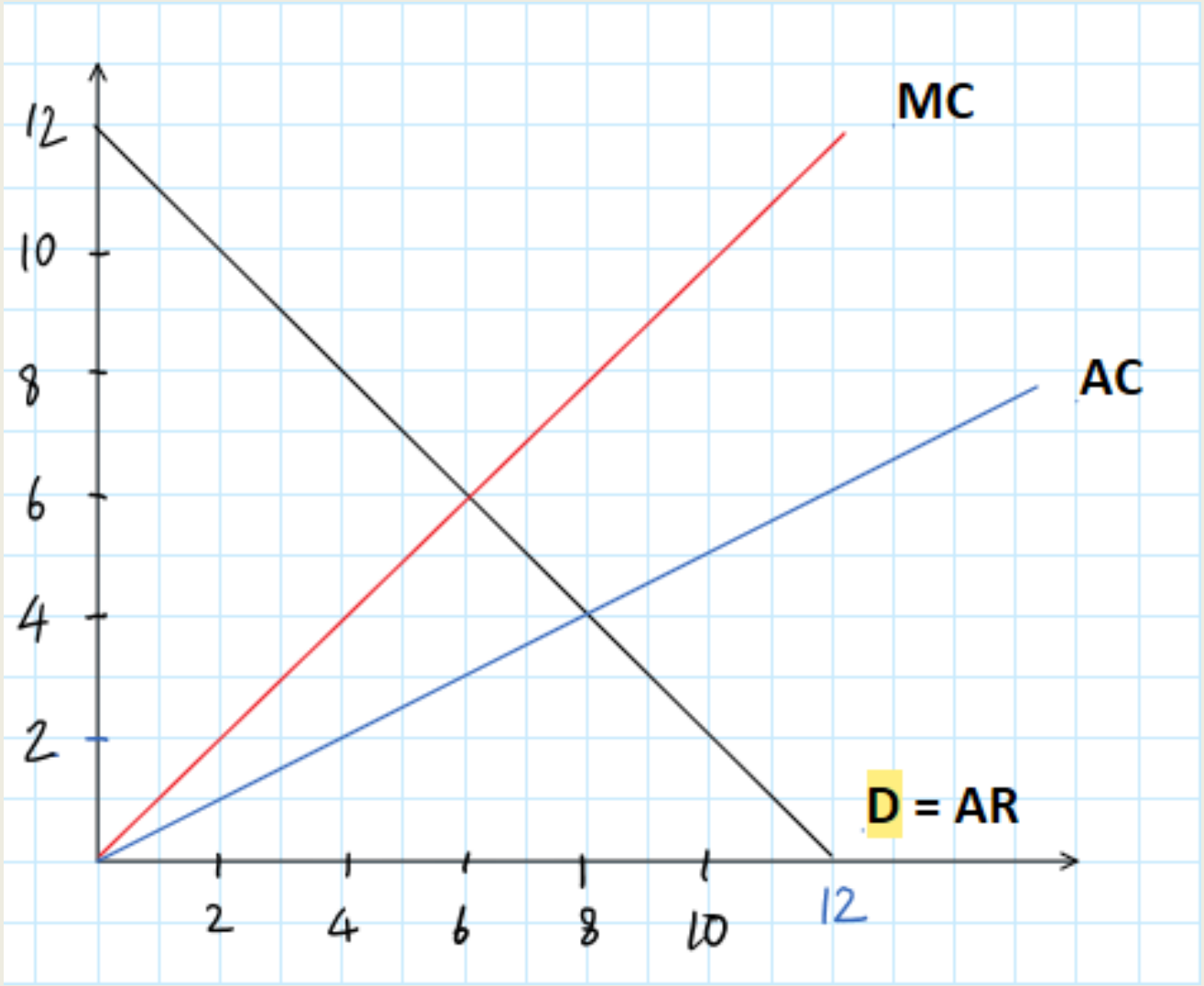
$$AR = \frac{TR}{Q} = \_\_\_\_\_ \; per \; ounce$$

$$MR = P + \frac{\Delta P}{\Delta Q} Q =$$

Suppose that the equation of the market demand curve is $P = a - bQ$.

Problem What are the expressions for the average and marginal revenues curves?

The Monopolist's Profit Maximization Condition

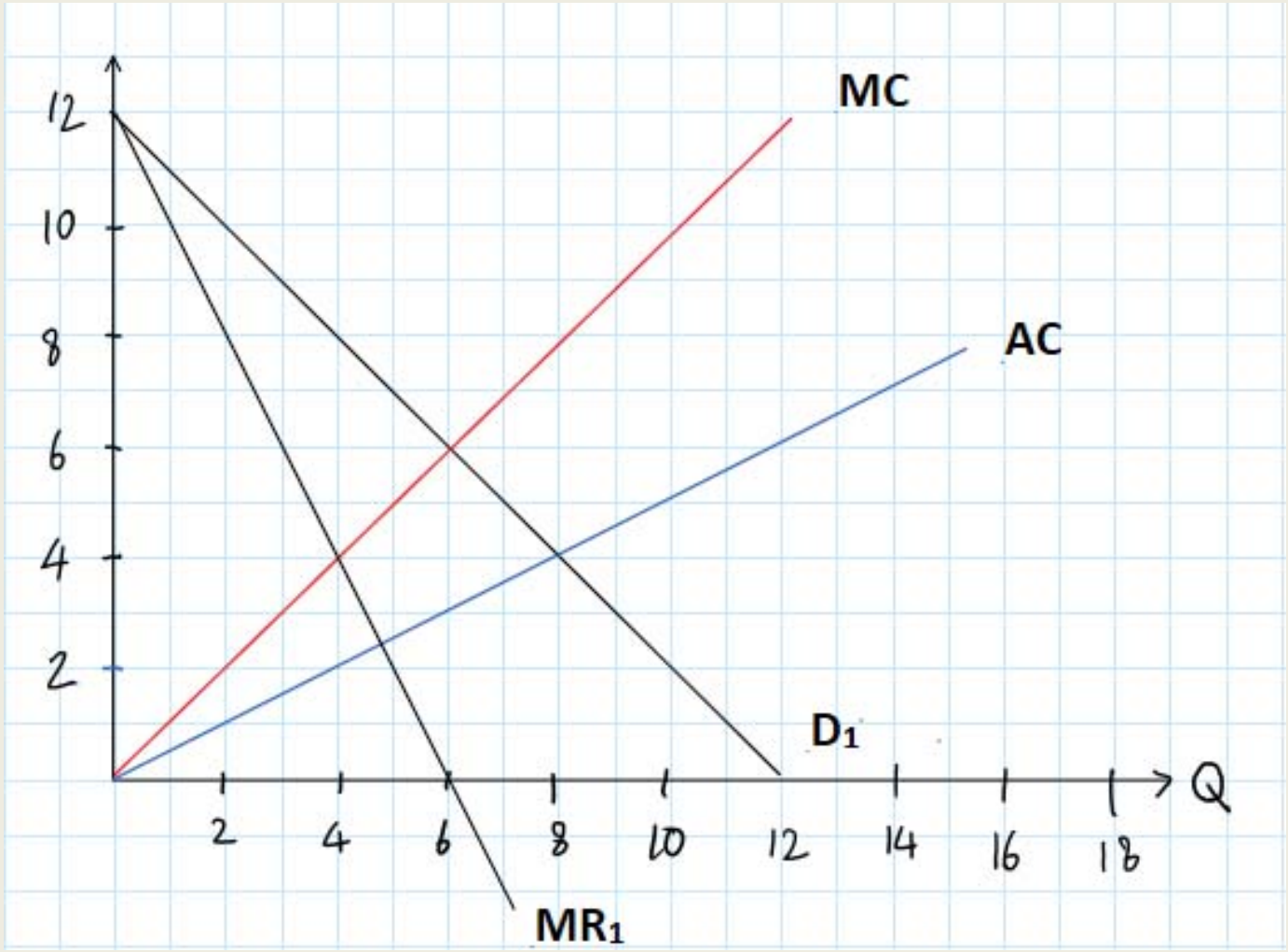


A monopolist does not have a supply curve

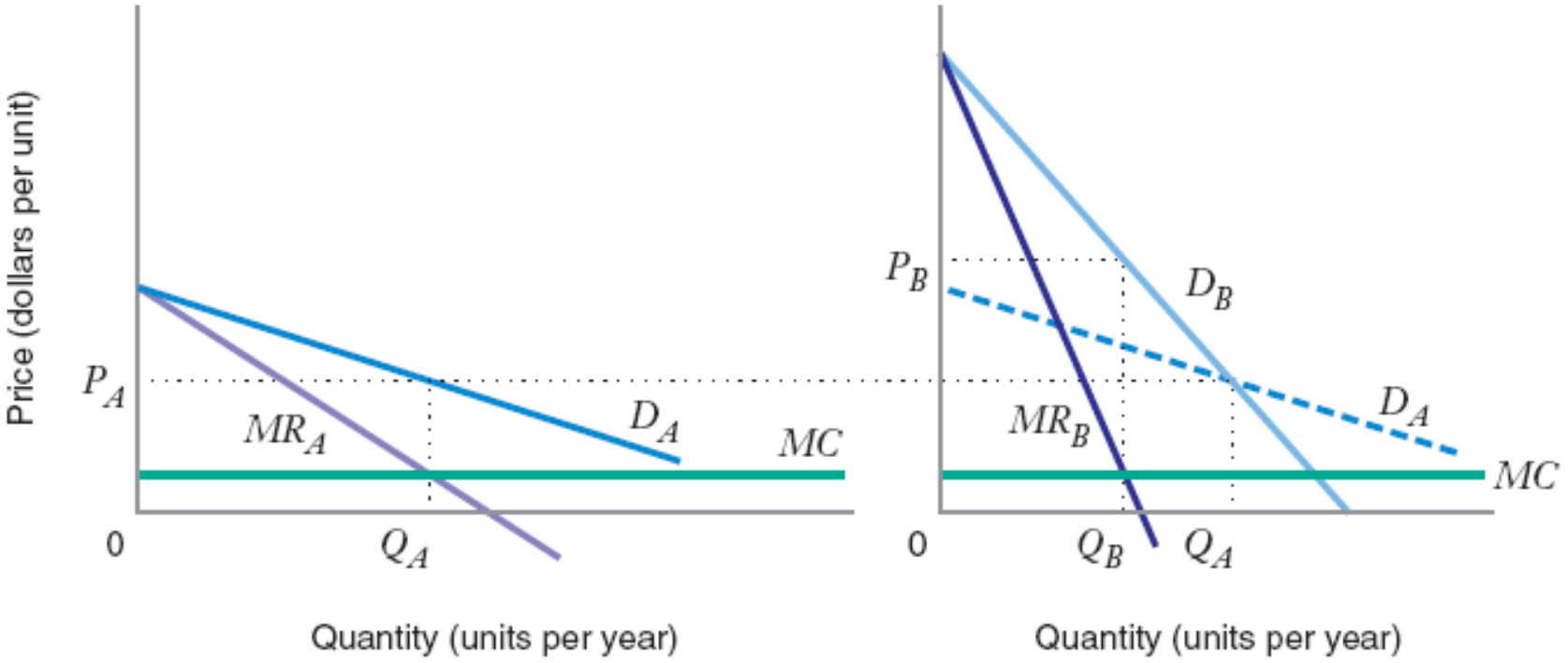
A monopolist does not have a supply curve (i.e., an optimal output for any exogenously-given price) because price is endogenously-determined by demand: the monopolist picks a preferred point on the demand curve.

One could also think of the monopolist choosing output to maximize profits subject to the constraint that price be determined by the demand curve.

A monopolist does not have a supply curve



Price Elasticity of Demand and the Profit-Maximizing Price



Marginal Revenue and Price Elasticity of Demand

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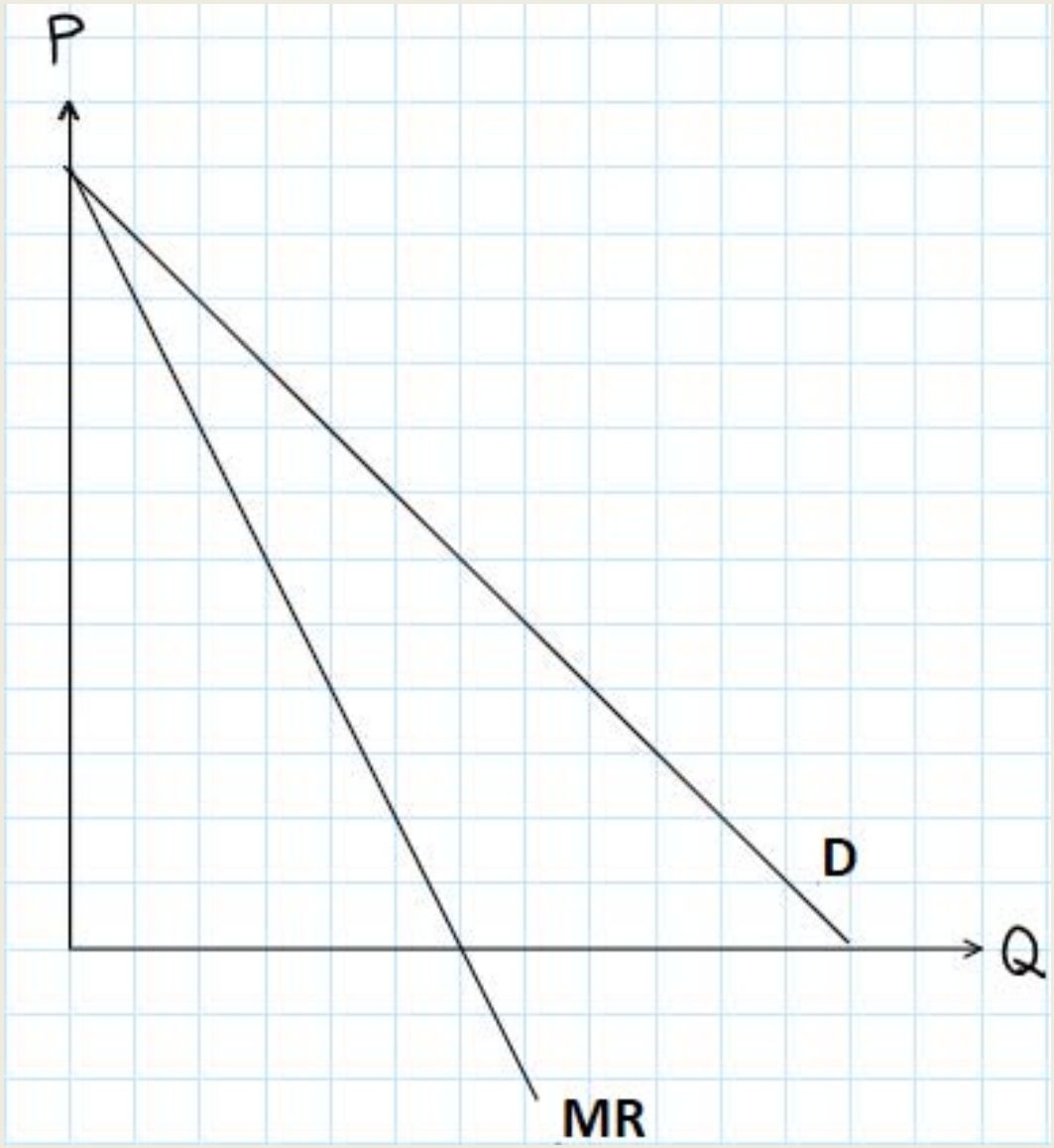

Marginal Revenue and Price Elasticity of Demand

	Relationship between	
Region of Demand Curve	Marginal Revenue and $\epsilon_{Q,P}$	Total Revenue and Price
		The monopolist can increase total revenue by decreasing price (and thereby increasing quantity) by a small amount.
		The monopolist's total revenue will not change when price (or quantity) is changed by a small amount.
		The monopolist can increase total revenue by increasing price (and thereby decreasing quantity) by a small amount.

Inverse Elasticity Pricing Rule (IEPR)

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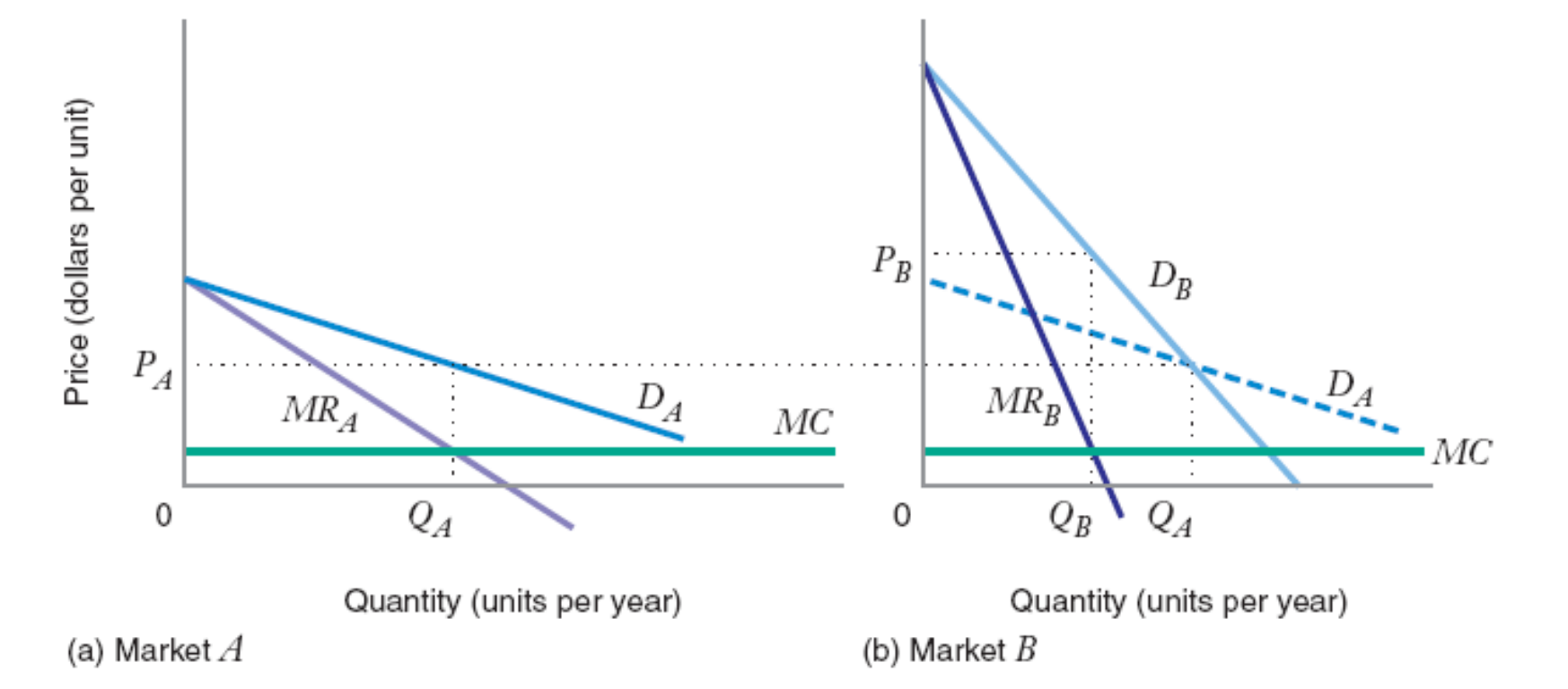
- Monopolist's optimal markup of price above marginal cost expressed as a percentage of price is equal to minus the inverse of the price elasticity of demand.

$$\frac{P* - MC*}{P*} = -\frac{1}{\varepsilon_{Q,P}}$$

- IEPR tells us about how much P* the monopolist should charge to maximize profits, given the PED.
- **The more price elasticity of demand, the smaller will be the optimal markup.**

Inverse Elasticity Pricing Rule (IEPR)



Learning-by-Doing Exercise: Computing the Optimal Monopoly Price for a Constant Elasticity Demand Curve

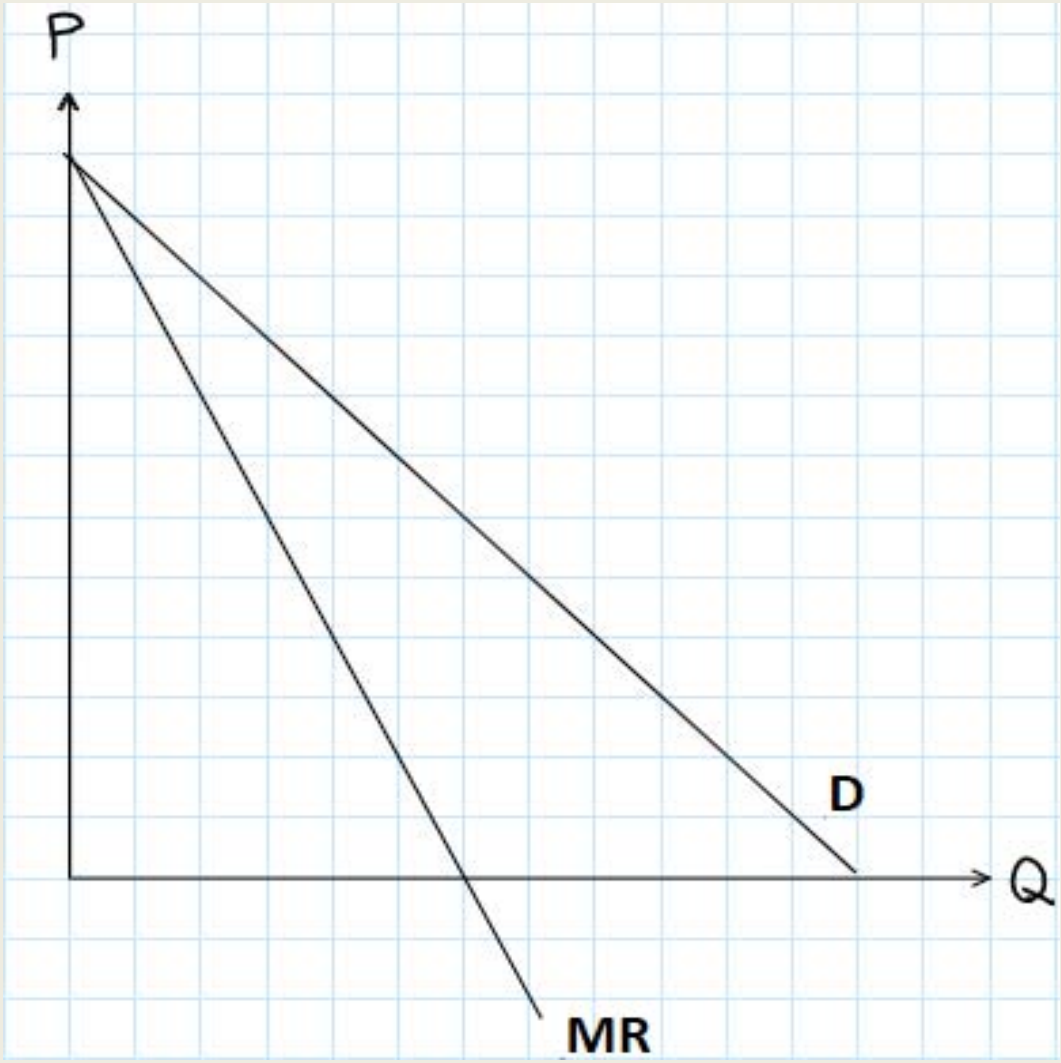
The general form of a constant elasticity demand curve is $Q = aP^{-b}$. At every point on such a curve, the price elasticity of demand equals $-b$.[6] Suppose a monopolist has a constant marginal cost $MC = \$50$.

Problem

(a) What is the monopolist's optimal price if its constant elasticity demand curve is $Q = 100P^{-2}$?

(b) What is the monopolist's optimal price if its constant elasticity demand curve is $Q = 100P^{-5}$?

The Monopolist will only operates on the elastic region of the demand curve.



The Lerner Index of Market Power

Definition: An agent has **Market Power** if he can affect the market price.

Sometimes, this is thought of as the degree to which a firm can raise price above marginal cost.

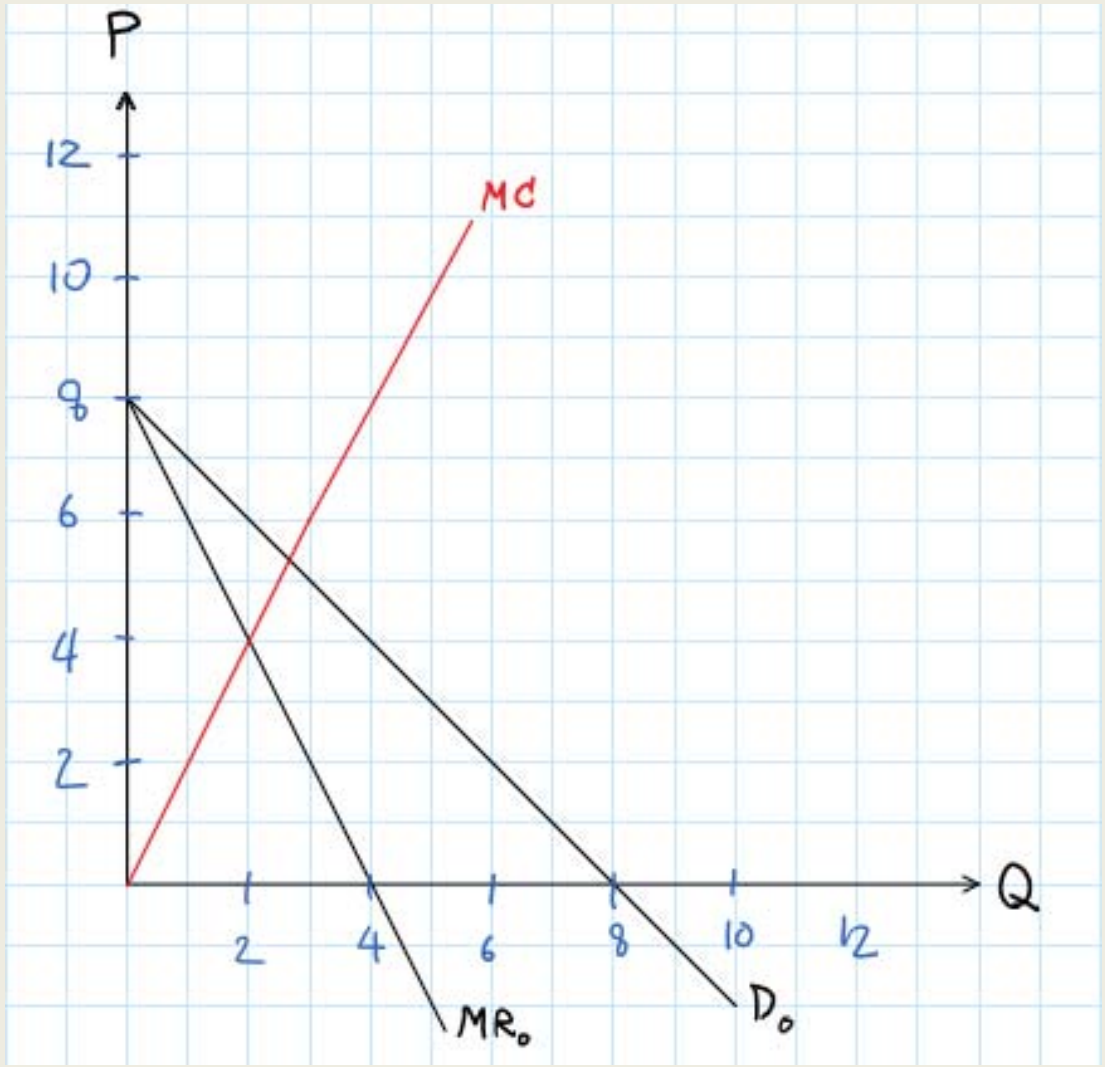
Definition: The **Lerner Index of market power i**s the price-cost margin, (P*-MC)/P*.

This index ranges between 0 (for competitive firms) and 1 (for a monopolist facing a unit-elastic demand).

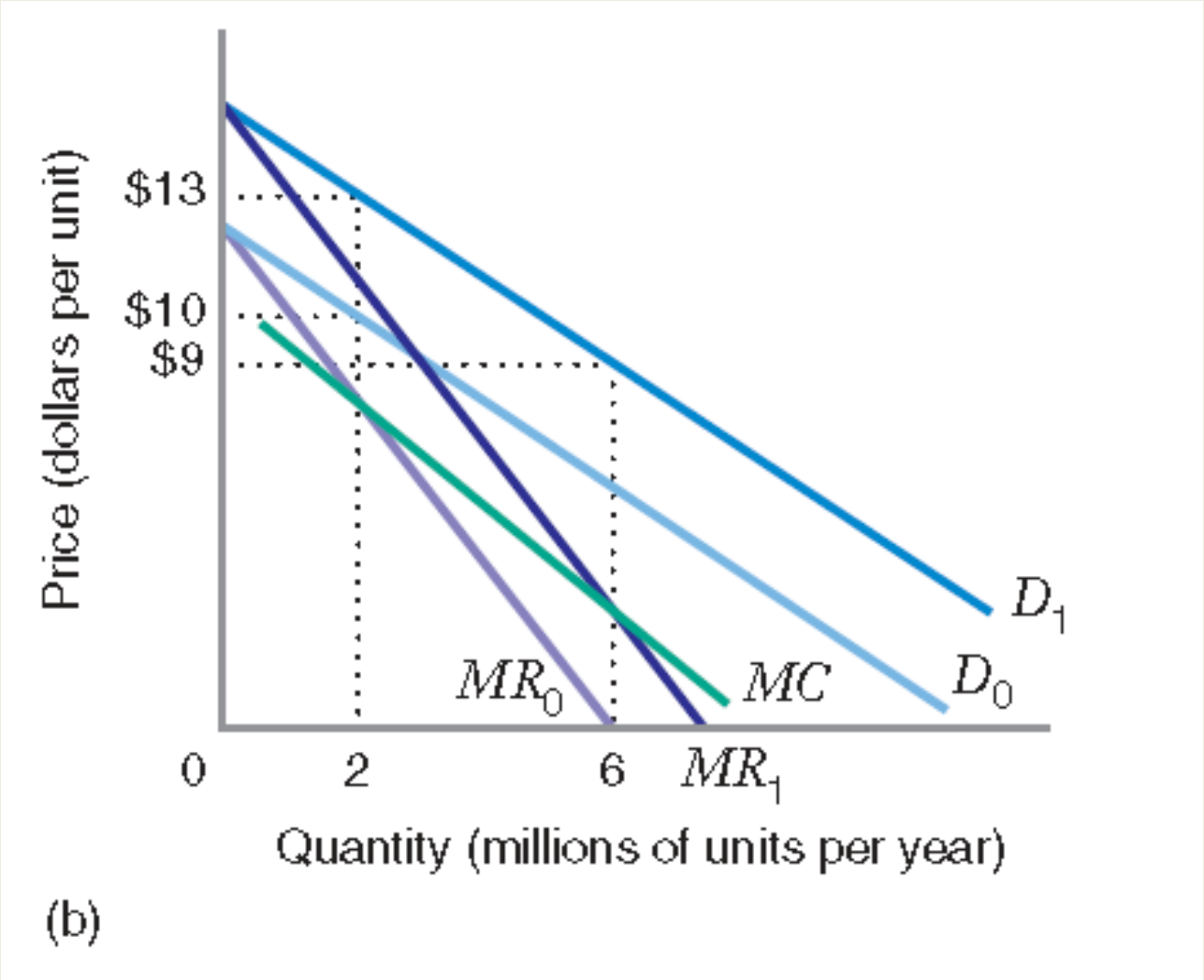
Price Elasticity of Demand, Price, and Marginal Cost

	Elasticity of Demand, ε	Price/Marginal Cost Ratio, $p/MC = 1/[1 + (1/\varepsilon)]$	Lerner Index, $(p - MC)/p = -1/\varepsilon$
←more elastic less elastic→	–1.01	101	0.99
	–1.1	11	0.91
	–2	2	0.5
	–3	1.5	0.33
	–5	1.25	0.2
	–10	1.11	0.1
	–100	1.01	0.01
	$-\infty$	1	0

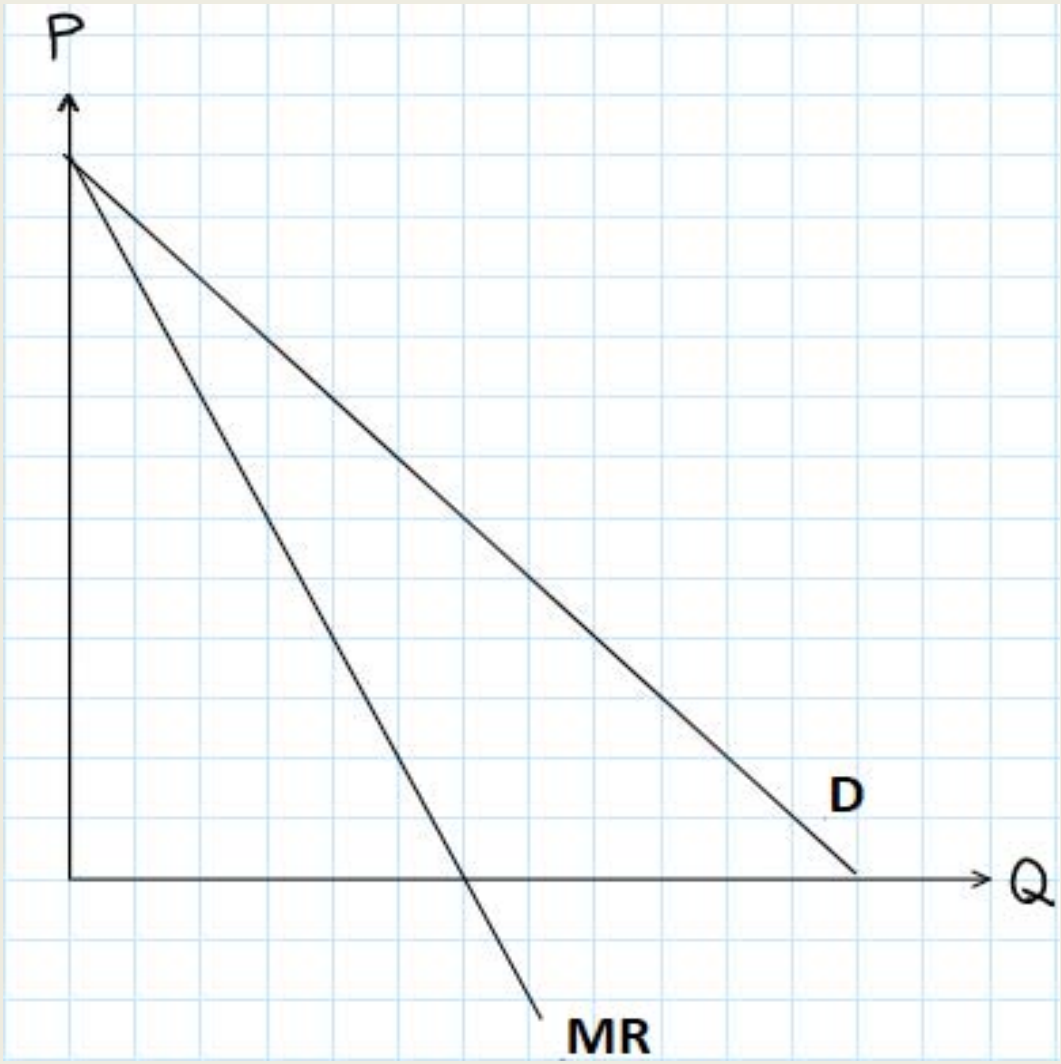
Comparative Statics – Shifts in Demand



Comparative Statics – Shifts in Demand



The Monopoly Midpoint Rule



For a constant MC, P* is found using the midpoint rule:

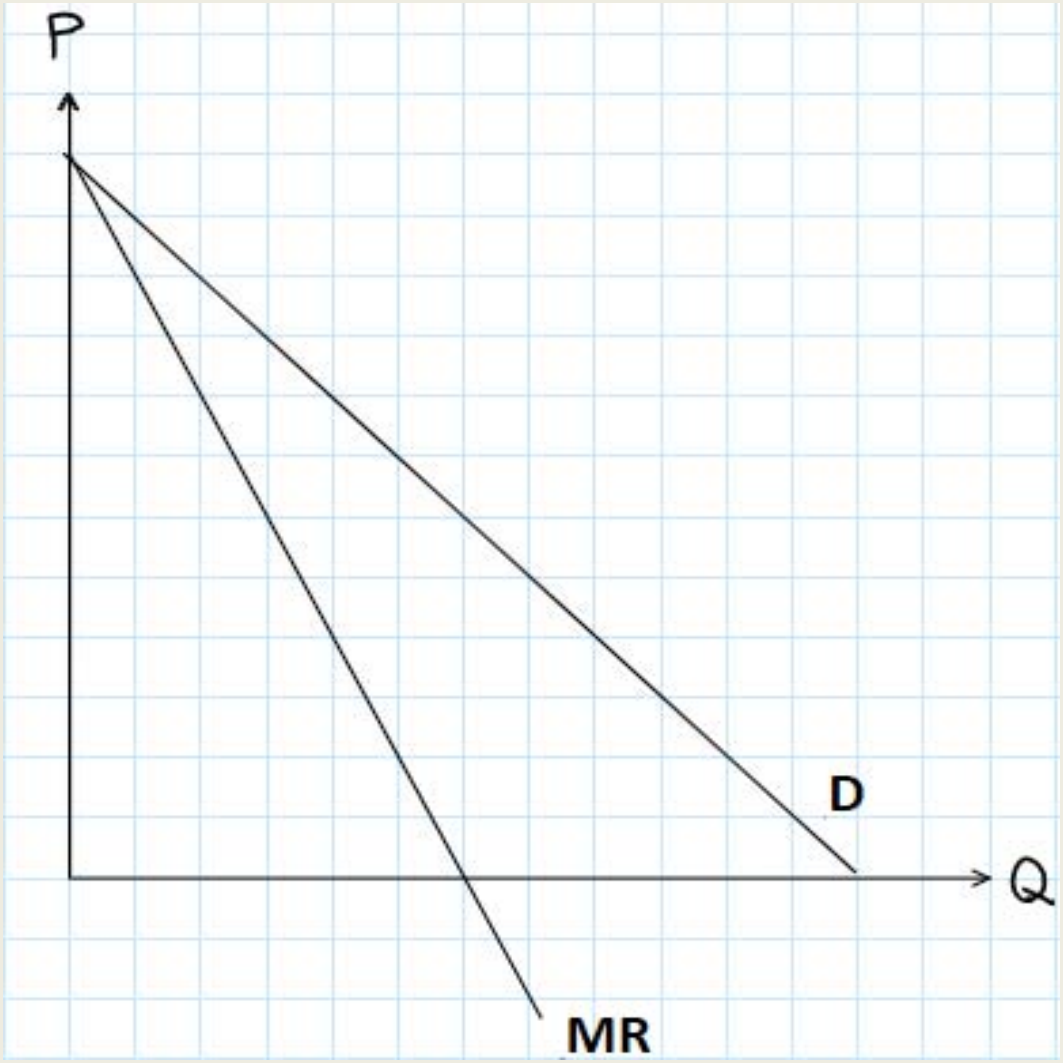
P* is halfway between the vertical intercept of the demand curve *a* (choke price) and vertical intercept of the MC curve *c*.

Learning-by-Doing Exercise: Computing the Optimal Price Using the Monopoly Midpoint Rule

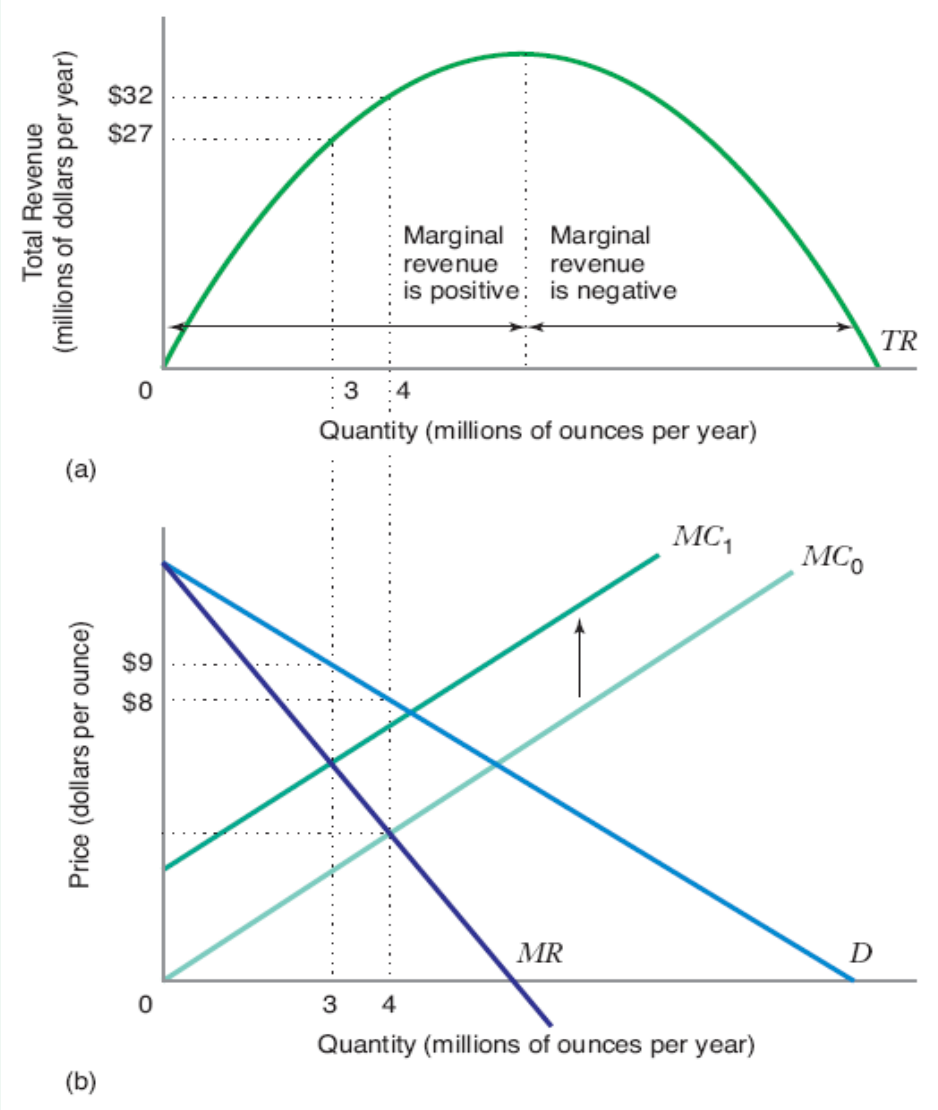
Suppose a monopolist faces a linear market demand curve $P = a - bQ$ and has a constant marginal cost $MC = c$ (as illustrated in Figure 11.11).

Problem What is the monopolist's profit-maximizing quantity and price?

Comparative Statics – Shifts in MC

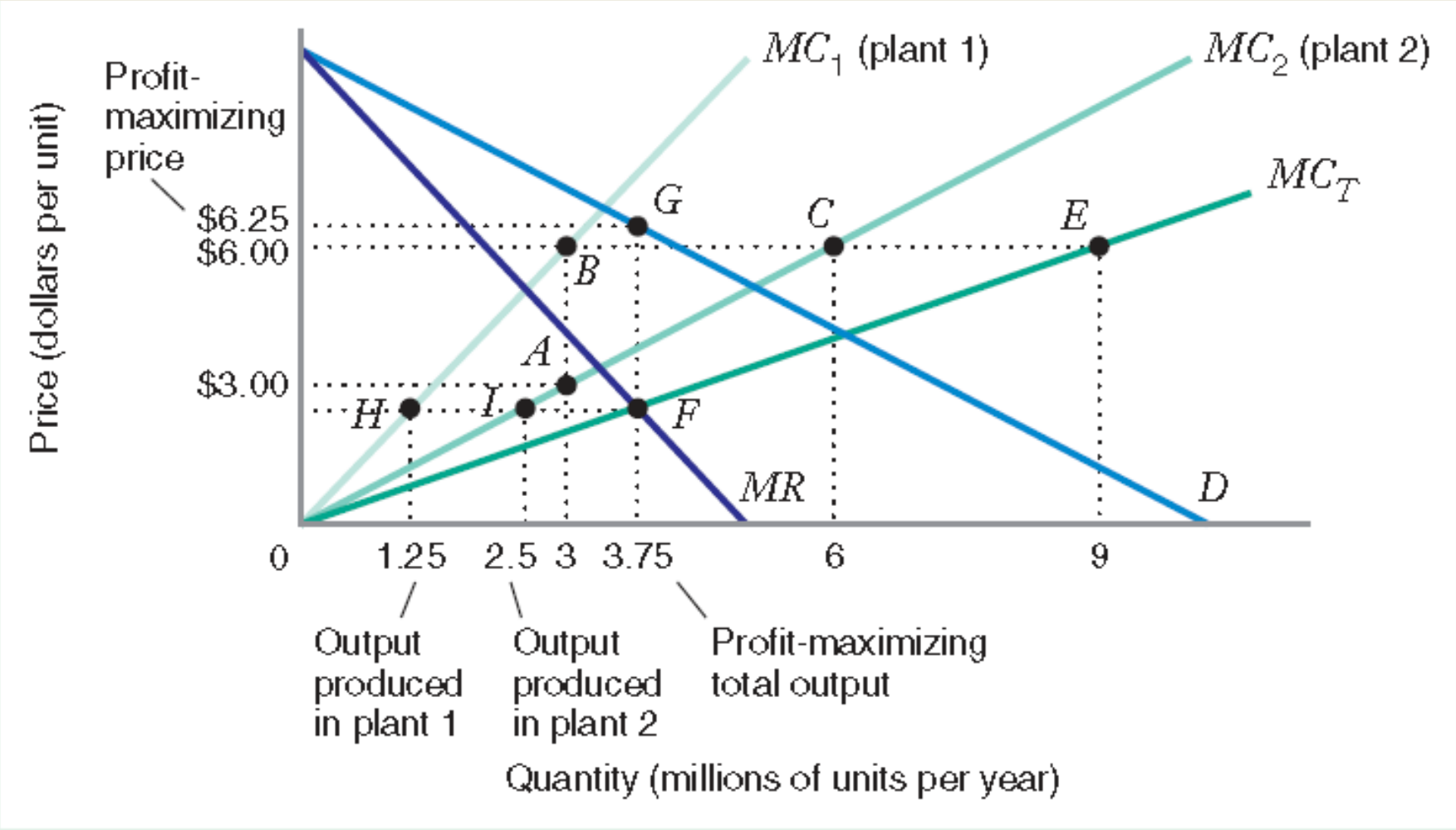


Comparative Statics – Shifts in MC



- Upward shift of MC decreases the profit maximizing monopolist's total revenue.
- Downward shift of MC increases the profit maximizing monopolist's total revenue.

Monopoly with Multiple Plants

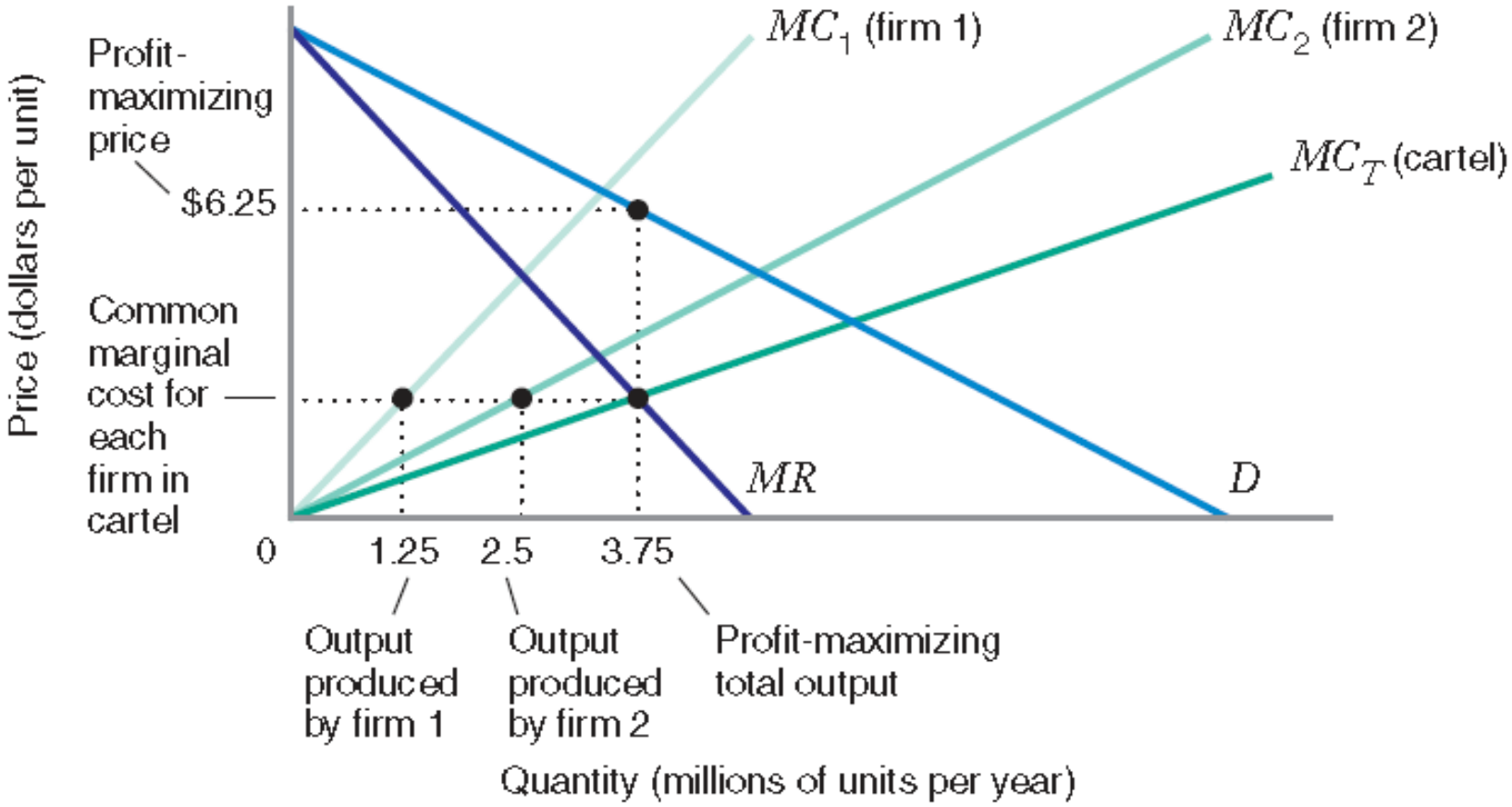


Output choices with 2 plants

Monopoly with Two Markets

Profit Maximization by Cartel

Cartel A group of producers that collusively determines the price and output in a market.

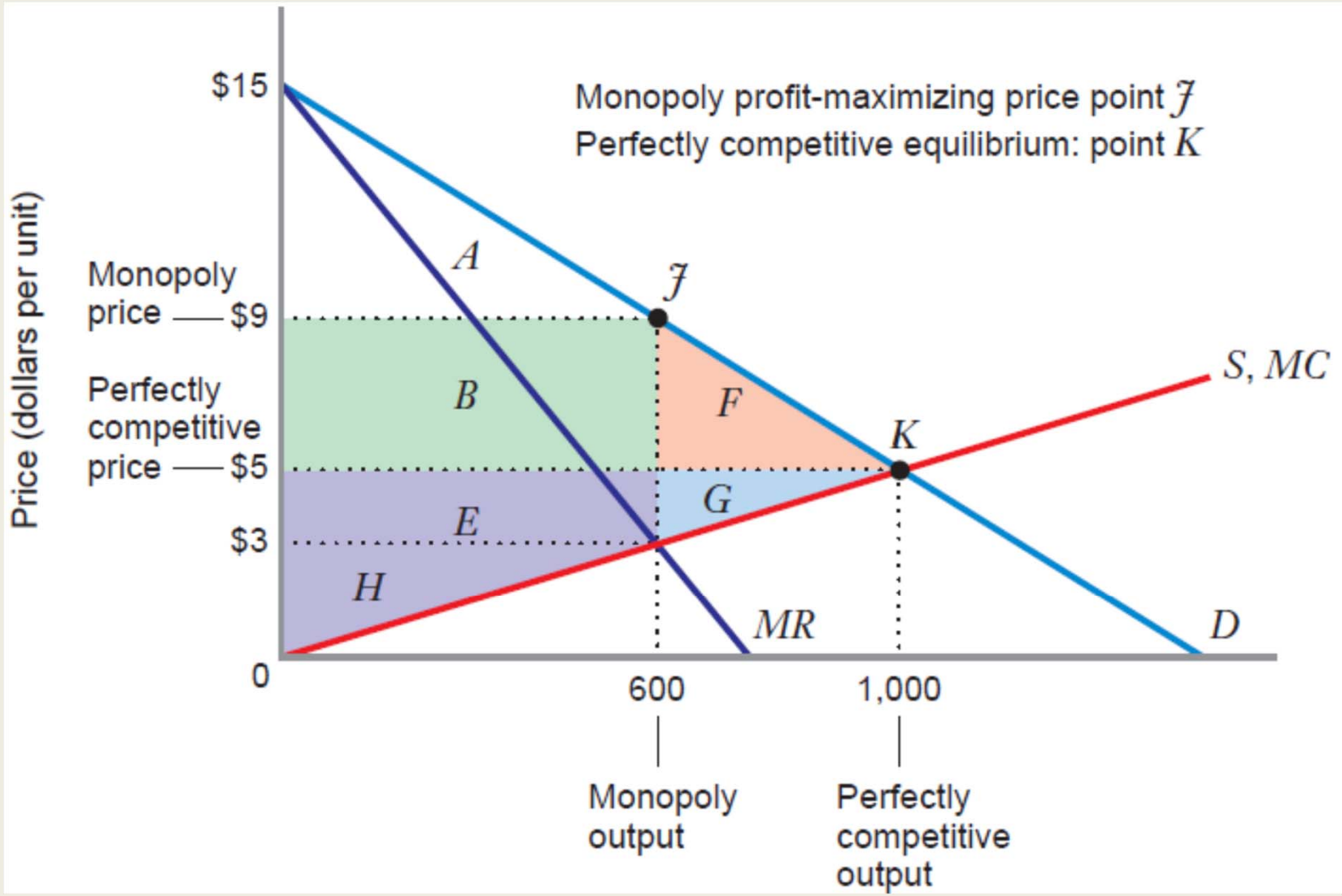


The Welfare Economies of Monopoly

Since the monopoly equilibrium output does not, in general, correspond to the perfectly competitive equilibrium, **it entails a dead-weight loss**.

Suppose that we compare a monopolist to a competitive market, where the supply curve of the competitors is equal to the marginal cost curve of the monopolist.

The Welfare Economies of Monopoly



The Welfare Economies of Monopoly

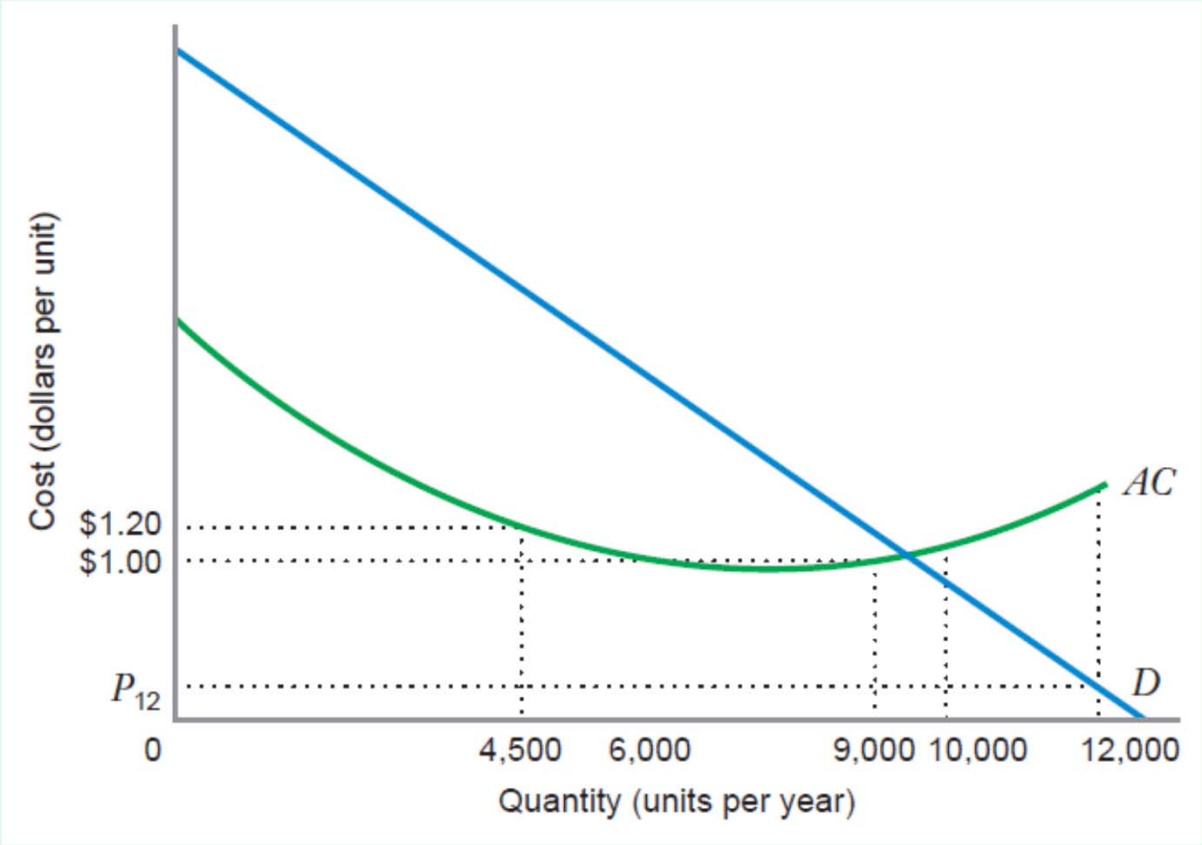
	Perfect Competition	Monopoly	Impact of Monopoly
Consumer surplus			
Producer surplus			
Net economic benefit			

Why does Monopoly exist?

Definition: A market is a **natural monopoly** if the total cost incurred by a single firm producing output is less than the combined total cost of two or more firms producing this same level of output among them.

Why does Monopoly exist?

FIGURE 11.17 **Natural Monopoly Market**
Any output level less than 10,000 units per year can be produced most cheaply by a single firm. For example, a single firm can produce an output of 9,000 units for an average cost of $1 per unit. Two firms, each producing 4,500 units, would incur an average cost of $1.20 per unit. Two firms could produce 12,000 units at a lower total cost than one firm could. However, this level of output would not be profitable because the price P_{12} at which 12,000 units would be demanded is less than the minimum level of average cost.



Why does Monopoly exist?

Definition: **Barriers to Entry** are factors that allow an incumbent firm to earn positive economic profits while making it unprofitable for newcomers to enter the industry.

1. **Structural Barriers to Entry –** occur when incumbent firms have cost or demand advantages that would make it unattractive for a new firm to enter the industry
2. **Legal Barriers to Entry –** exist when an incumbent firm is legally protected against competition
3. **Strategic Barriers to Entry –** result when an incumbent firm takes explicit steps to deter entry