Industrial Organization

Game Theory: Dynamic Games

Dominant Firm
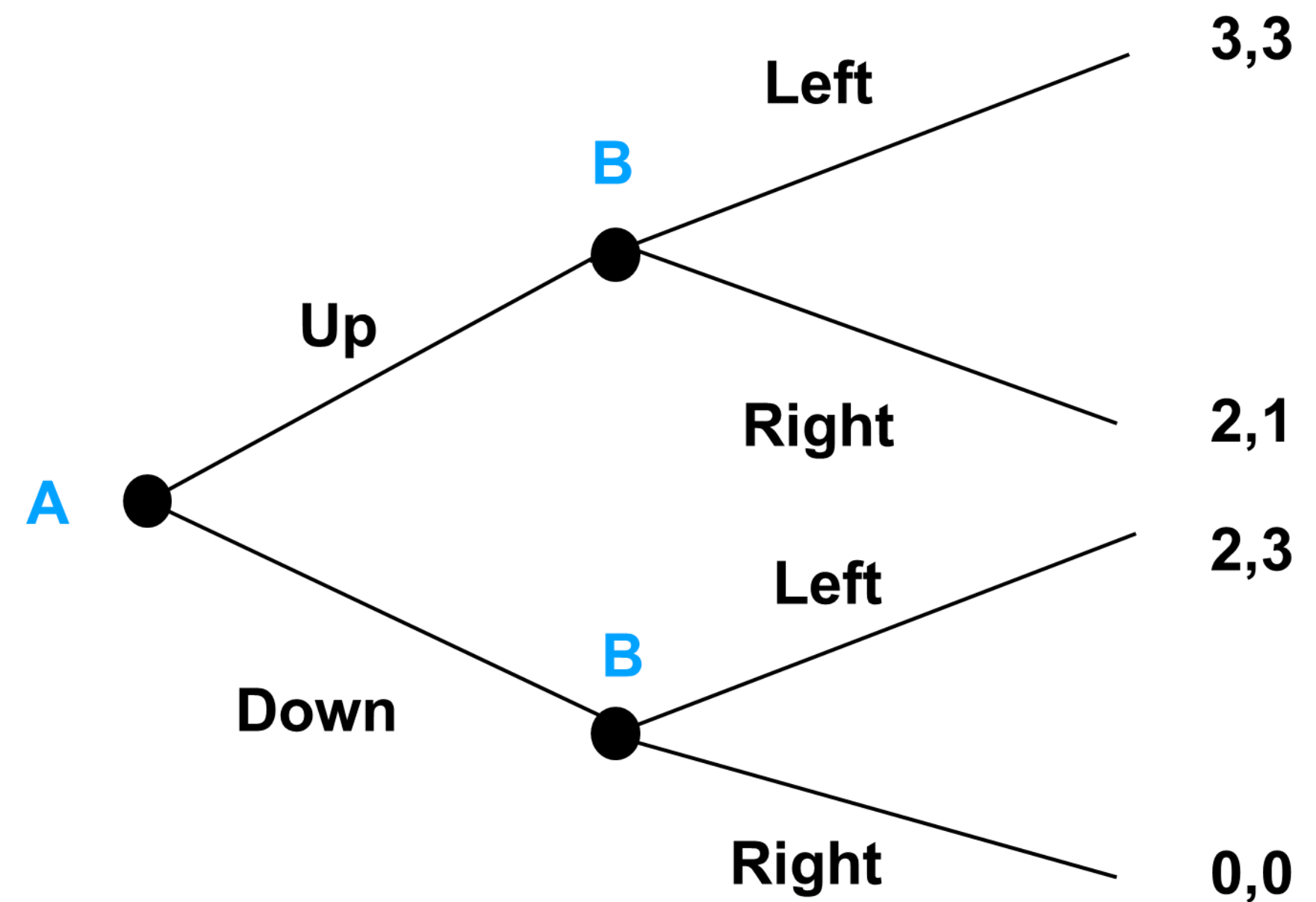
Week 3

Game Theory

SEQUENTIAL GAMES

Extensive-form games or sequential games:

✓ Game in which players do not choose their strategies at the same time, and players that choose later can see the strategies already chosen by other players.

✓ Representation: **game tree**

✓ Solution concept: **Subgame Perfect Nash Equilibrium (SPNE)**
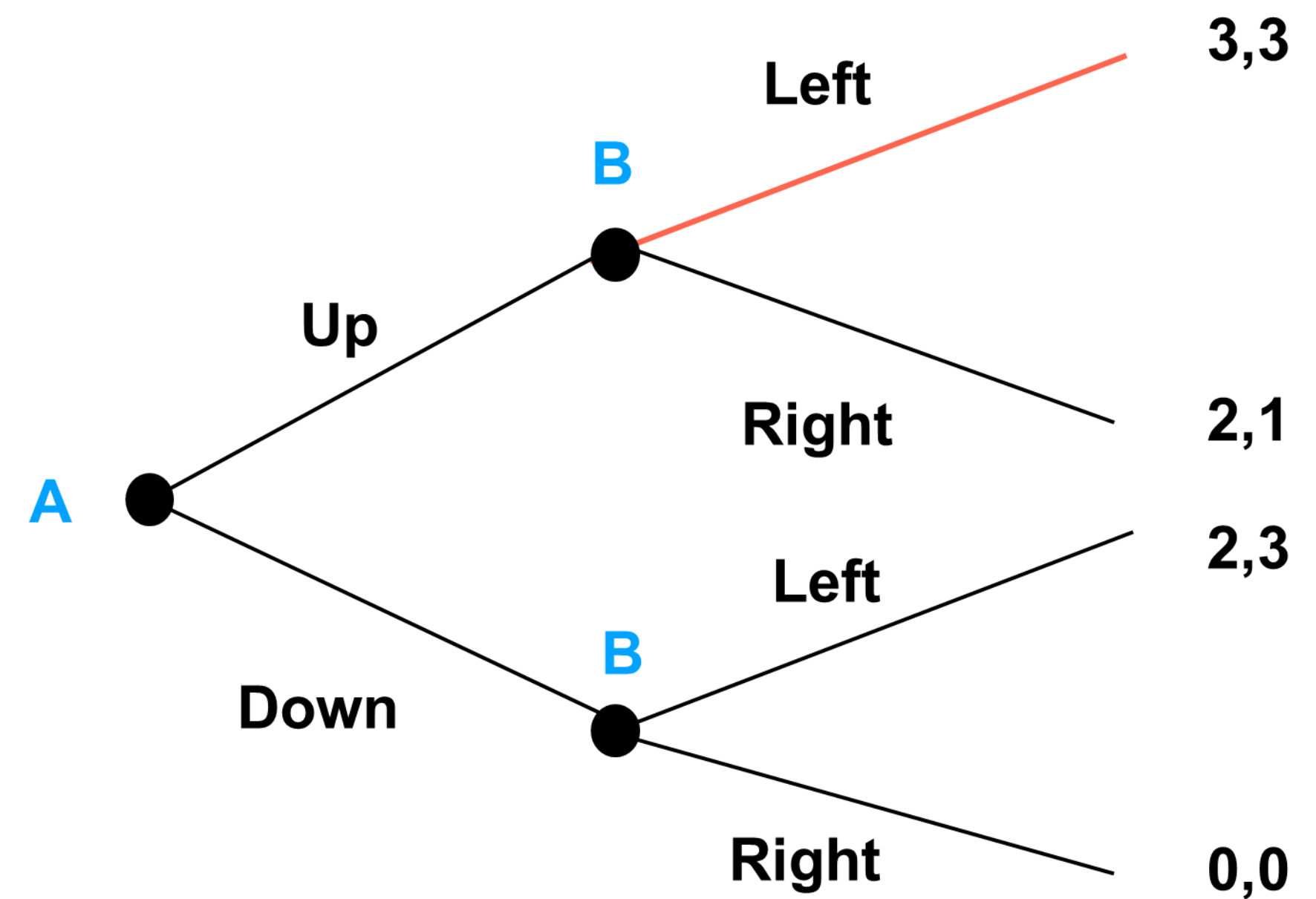
✓ How to get to the SPNE? **Backward Induction**

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Game Theory
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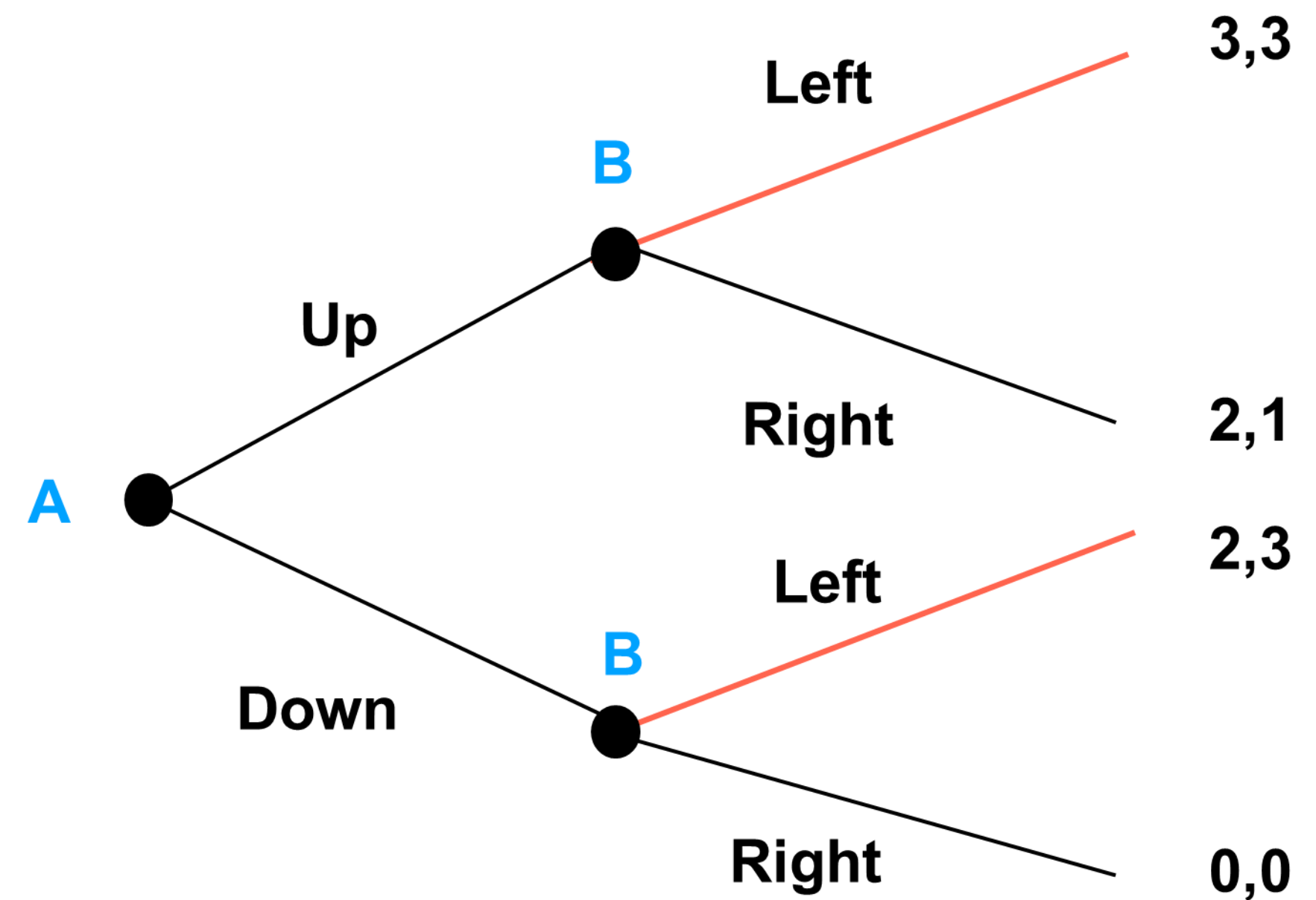
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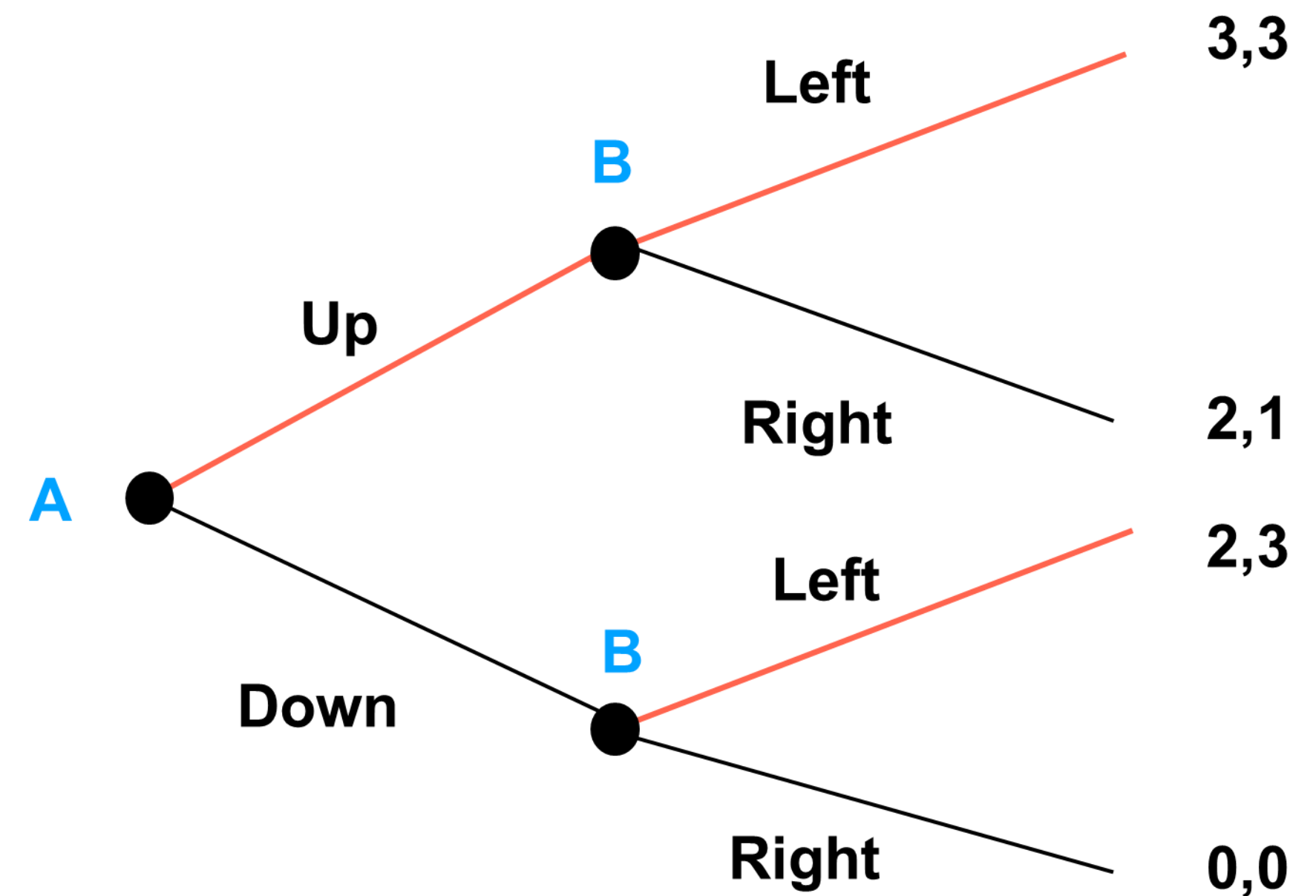
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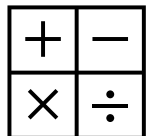✓ How to get to the SPNE? **Backward Induction**

Game Theory

EXERCISE

5. Firms 1 and 2 are both considering expanding into a small new geography. Firm 1 has been studying this possibility for a while and is ready to go ahead with the expansion now. Firm 2, on the other hand, will only be able to do so in 6 months.
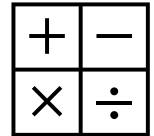
The investment needed to enter the new geography is **€5M.**

If they both enter, they will have operational profits of **€2M.**

If one of the firms enters the new geography alone, it will have an operational profit of **€10M.**

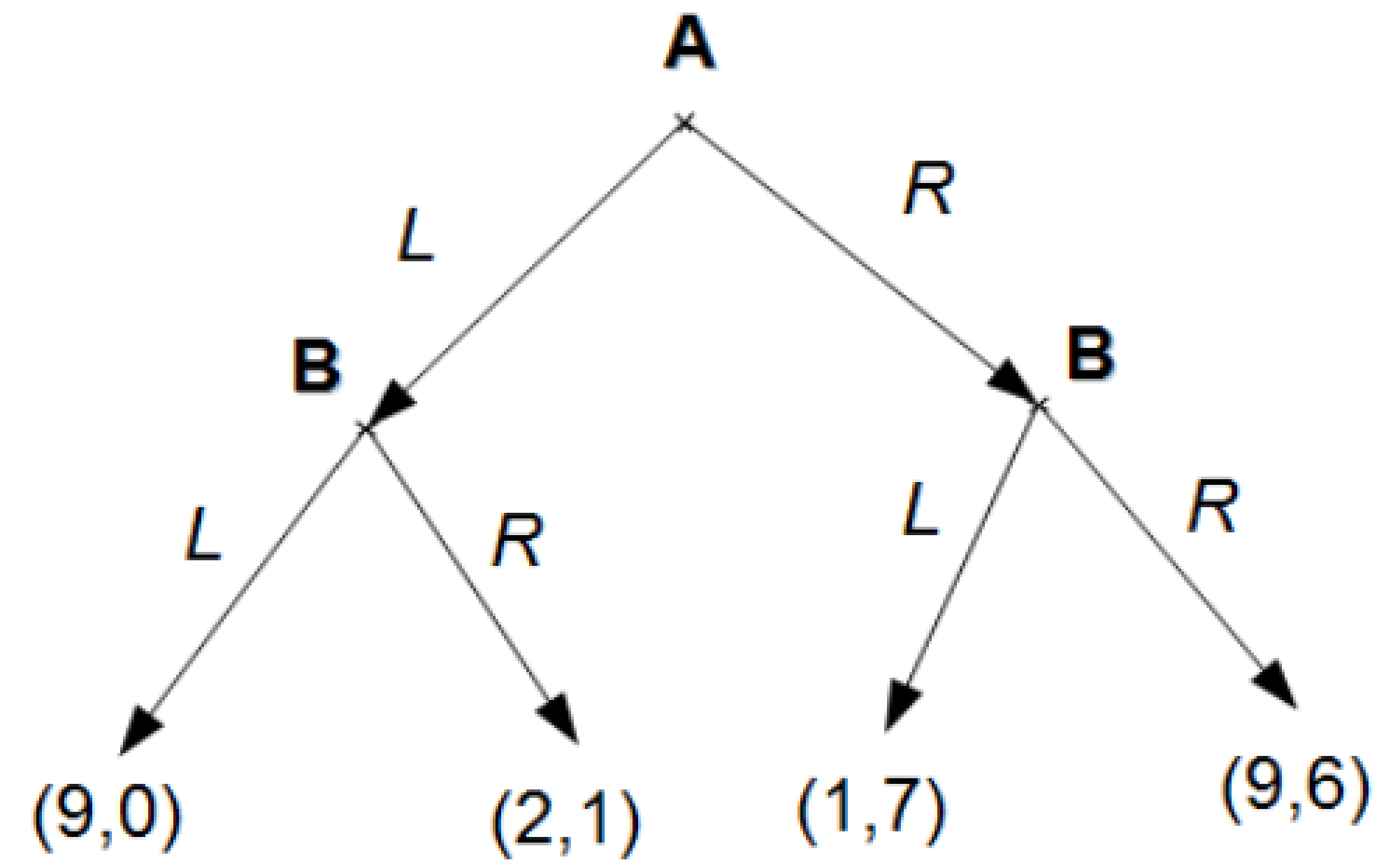**How do you expect Firm 1 to act? Draw the game and find its solution.**

Game Theory

EXERCISE

6. Consider the following game in extensive form. Find the equilibrium using Backward induction.

Represent the game in the normal form and find the Nash Equilibrium.

The Dominant Firm Model

What are the characteristics that "clearly identify" this model?

- **Dominant Firm**: think of a *larger* firm that will act as a price-maker (quasi-monopolist)

- **Competitive Fringe:** *smaller* firms that are price-takers

EXAMPLE : SEARCH ENGINE MARKET (2024)

Firm	Market Share
Google	91%
Bing	3%
Yahoo!	1%
Others	~5%

Source: Statista

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The dominant firm behaves like a price-maker which takes into account the behavior of small firms.
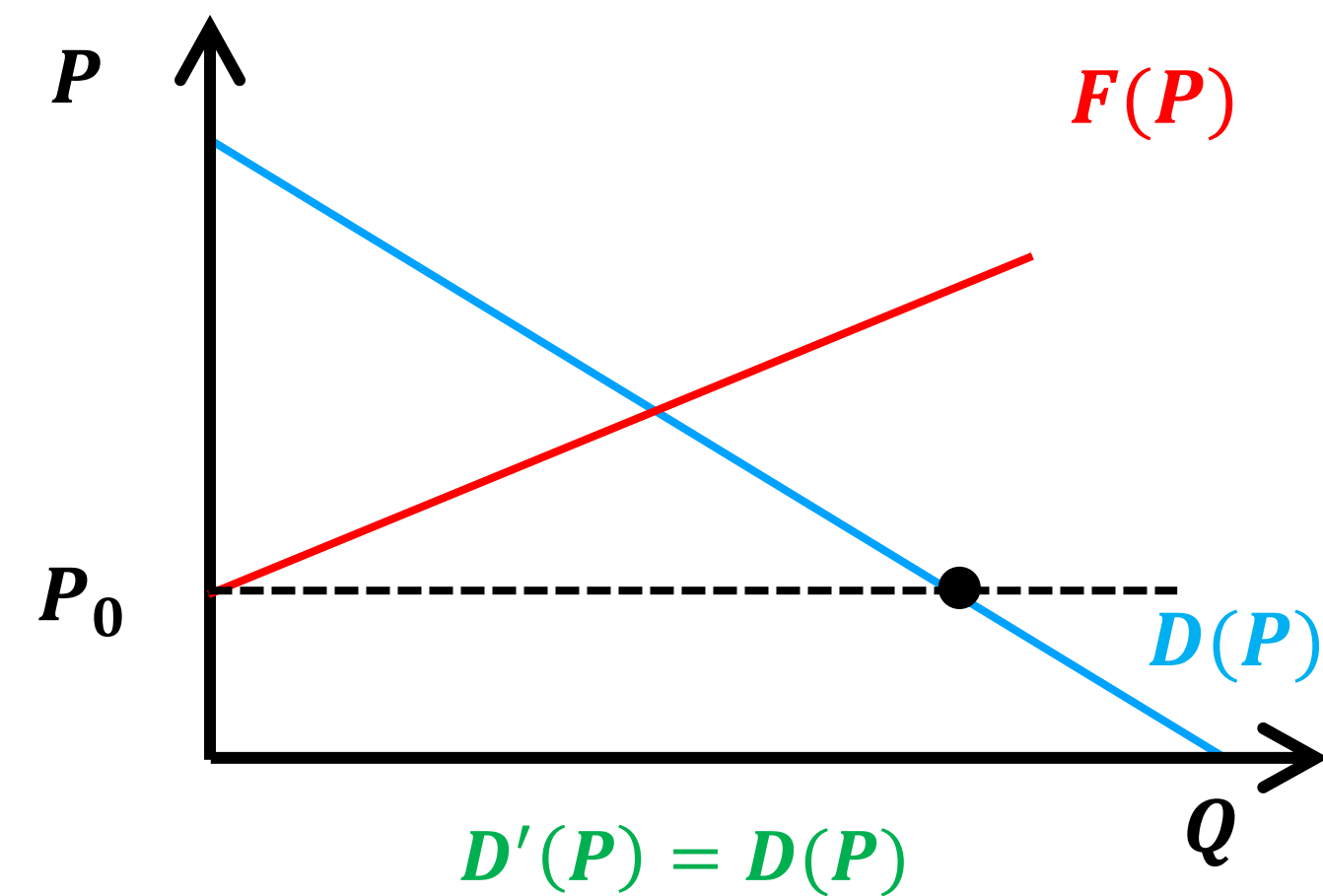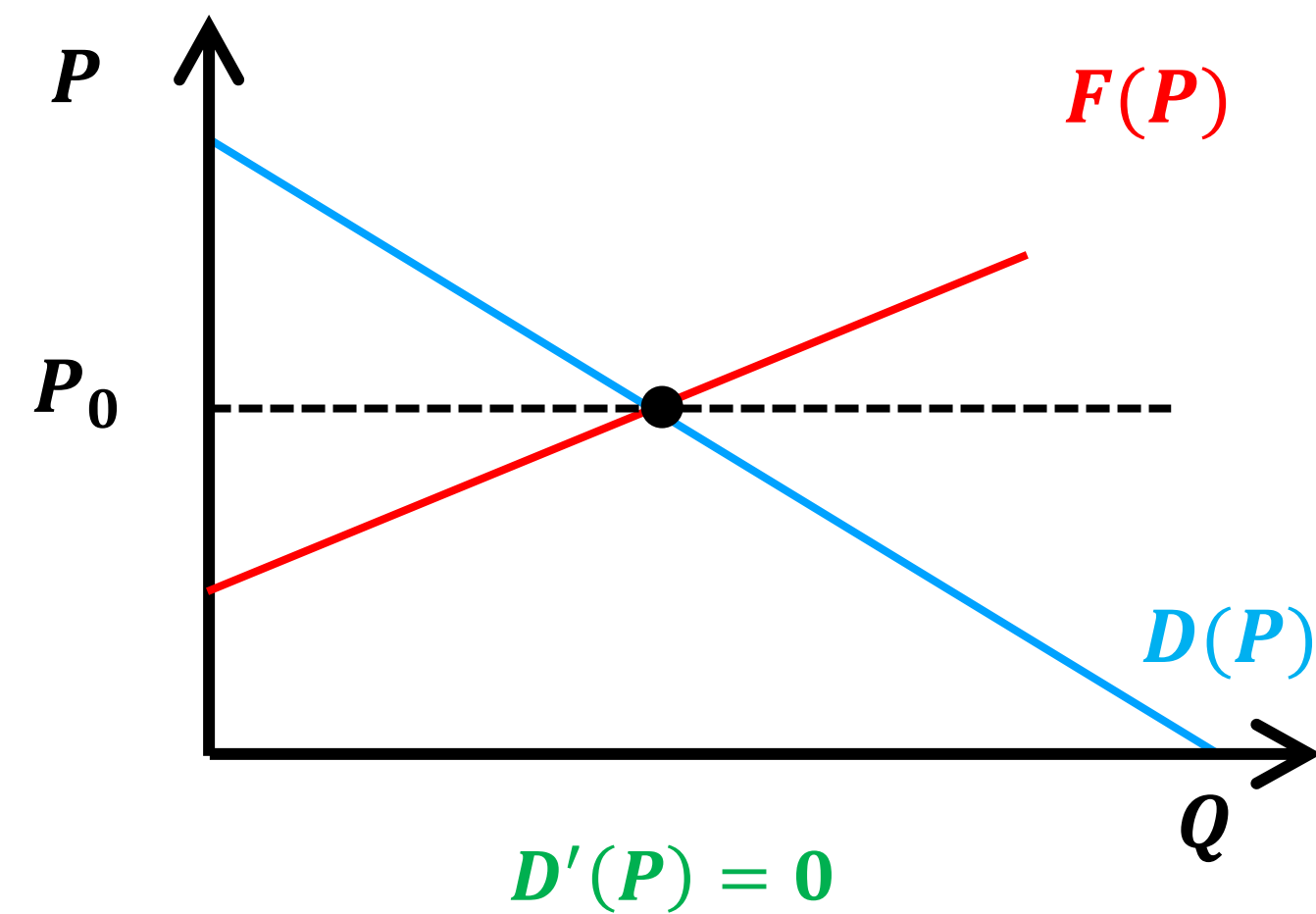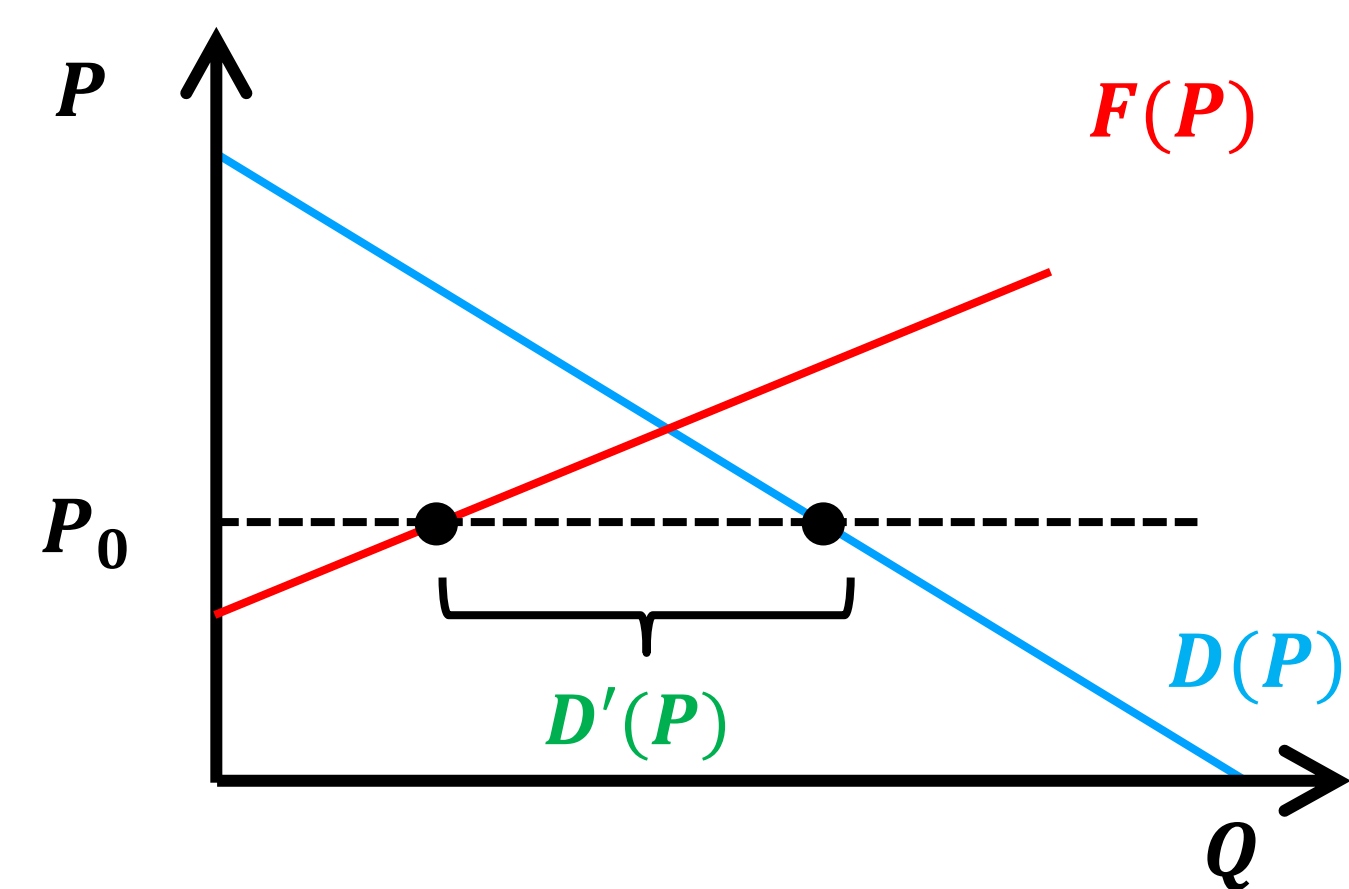
$$\pi_{Dominant\ Firm} = (P - MC) \times [D(P) - F(P)]$$

Residual Demand

The Dominant Firm Model

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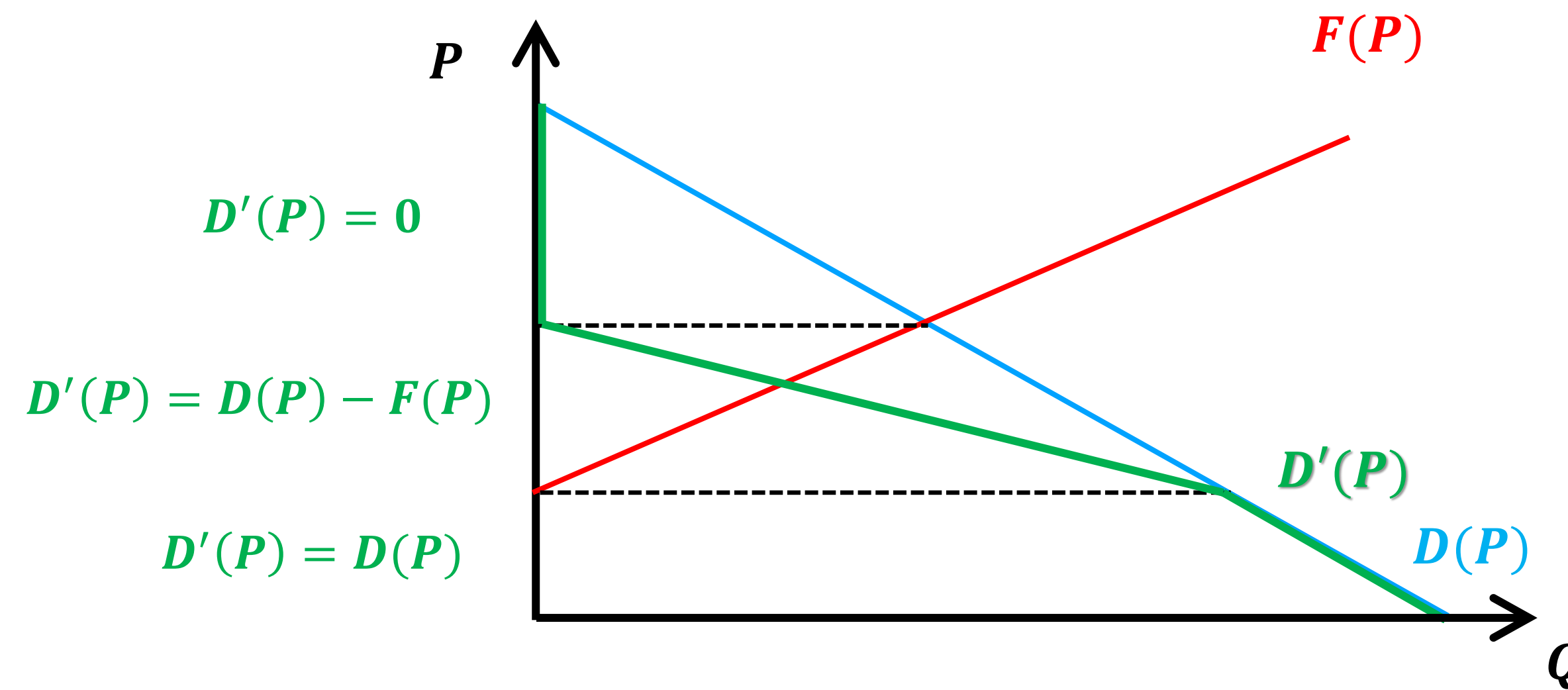
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Residual Demand

$D'(P)$

$F(P)$

$D(P)$

P_0

P

Q

$F(P)$

$D(P)$

P_0

P

Q

$D'(P) = 0$

$F(P)$

$D(P)$

P_0

P

Q

$D'(P) = D(P)$

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Residual Demand

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Suppose you are given a linear demand function and the cost structures of all firms (or the individual supply functions of the firms in the Fringe, instead of their cost structures)**. What would you do to solve the model?**

- **First step:** compute the (aggregate) **Fringe supply function (**Price-taker firms → $P = MC$**)**

- **Second step:** compute the **Residual Demand** ("faced by the Dominant Firm")

- **Third step:** solve the ***quasi-monopolist's* maximization problem** ⇒ then, calculate Price and Total Quantity **(**Price-maker firm → $MR = MC$**)**

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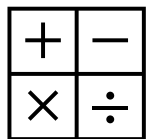# The Dominant Firm Model
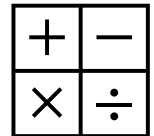
EXERCISE

2. Consider a market, with demand given by $P = 20 - 2Q$, which is constituted by 3 firms (A, B, and C).

Firm A is more efficient than the other two, operating with a constant marginal cost equal to 9.

The total costs of firms B and C are given by the function $CT_i = q_i * (q_i + 11)$, with i = B, C.

Find the market equilibrium, supposing firm A acts like a dominant firm and firms B and C like a competitive fringe.

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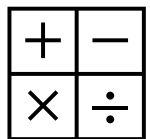BUSINESS & ECONOMICS
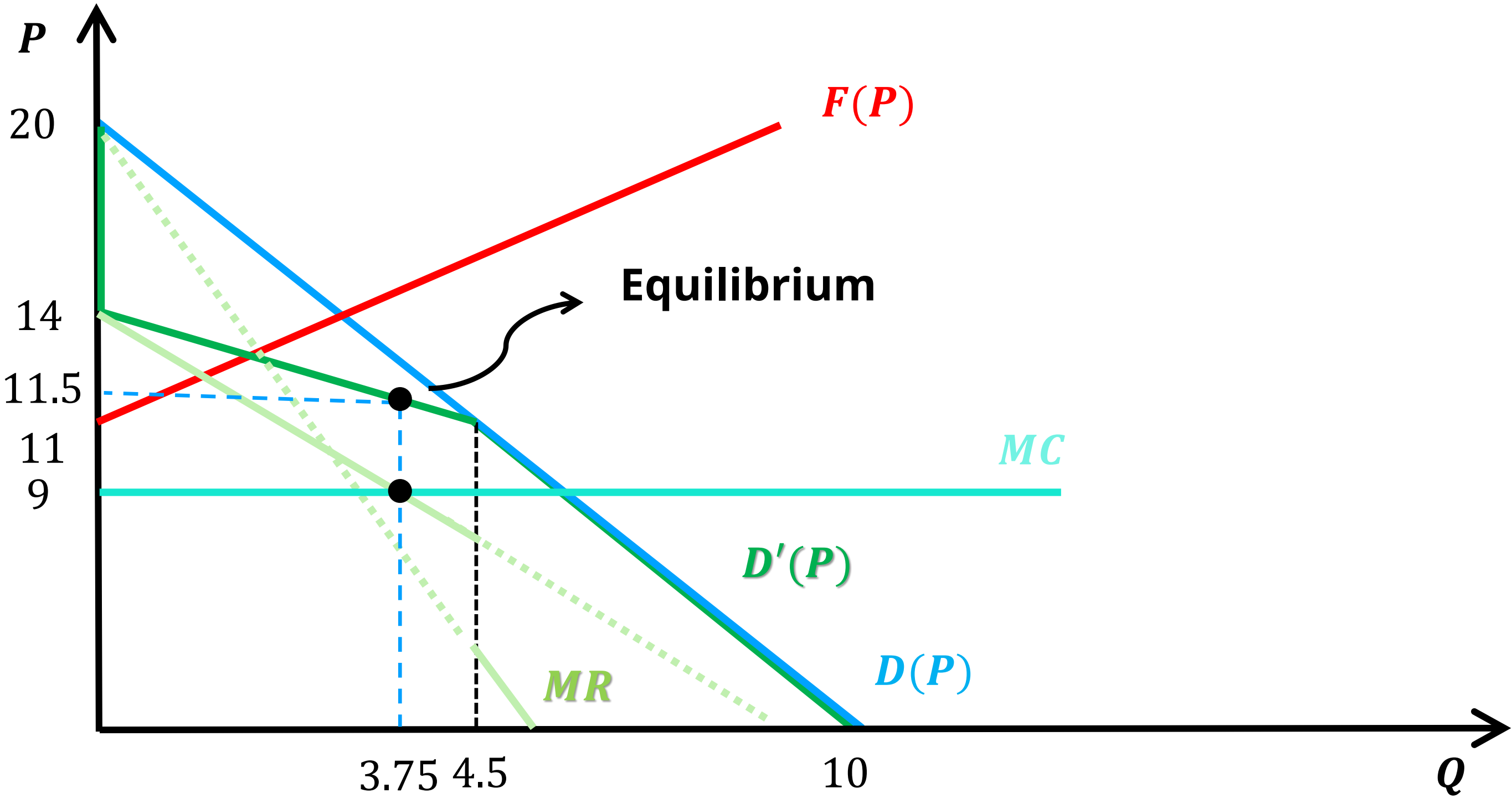
The Dominant Firm Model

EXERCISE

Repeat the previous exercise but consider that firm A operates now with a constant marginal cost equal to 7.

(For another numerical example, see question 1, section 4.1 of the IO Exercise Book)
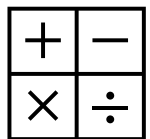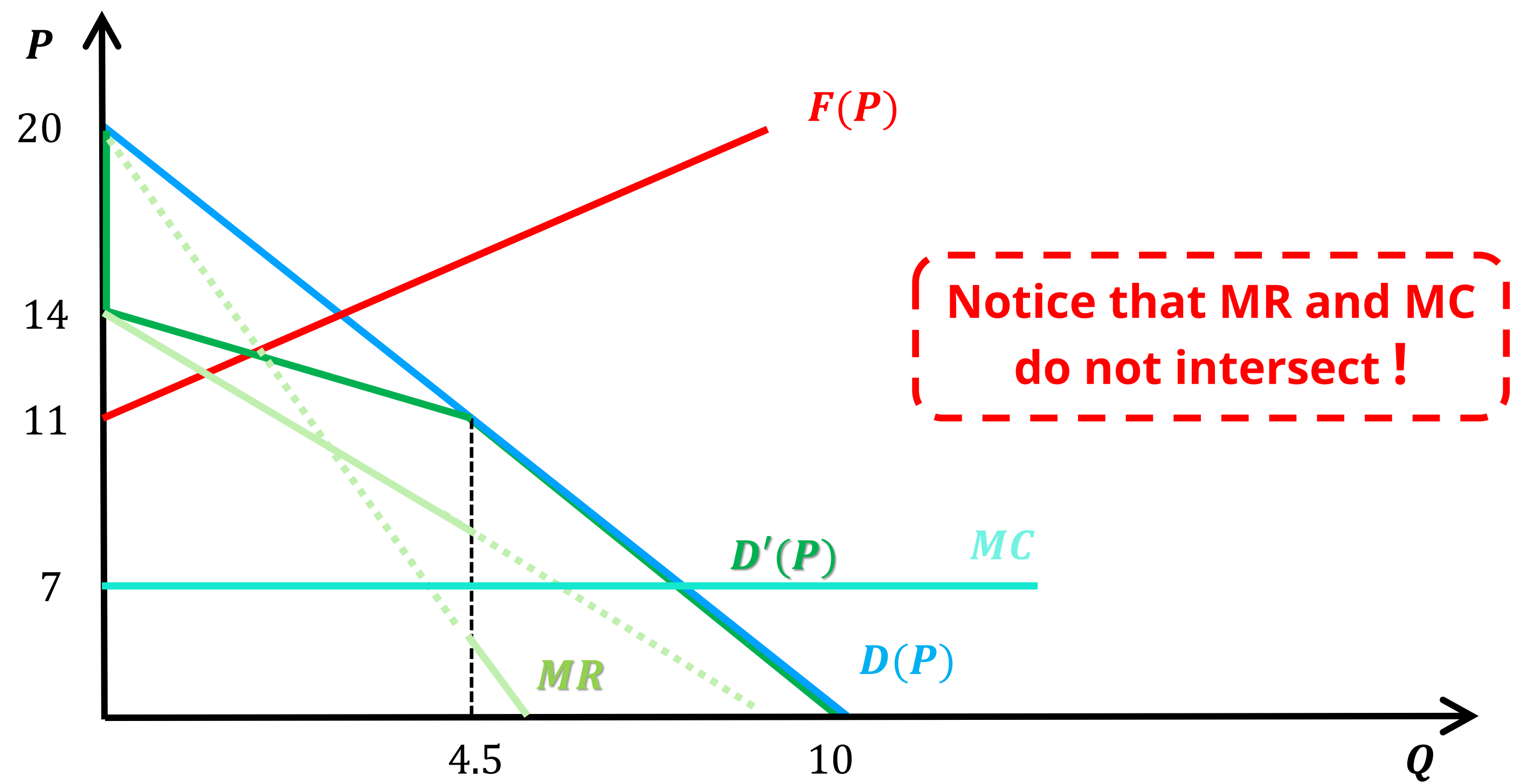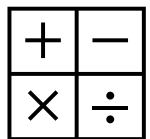
The Dominant Firm Model

EXERCISE

The Dominant Firm Model

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Notice that MR and MC do not intersect!
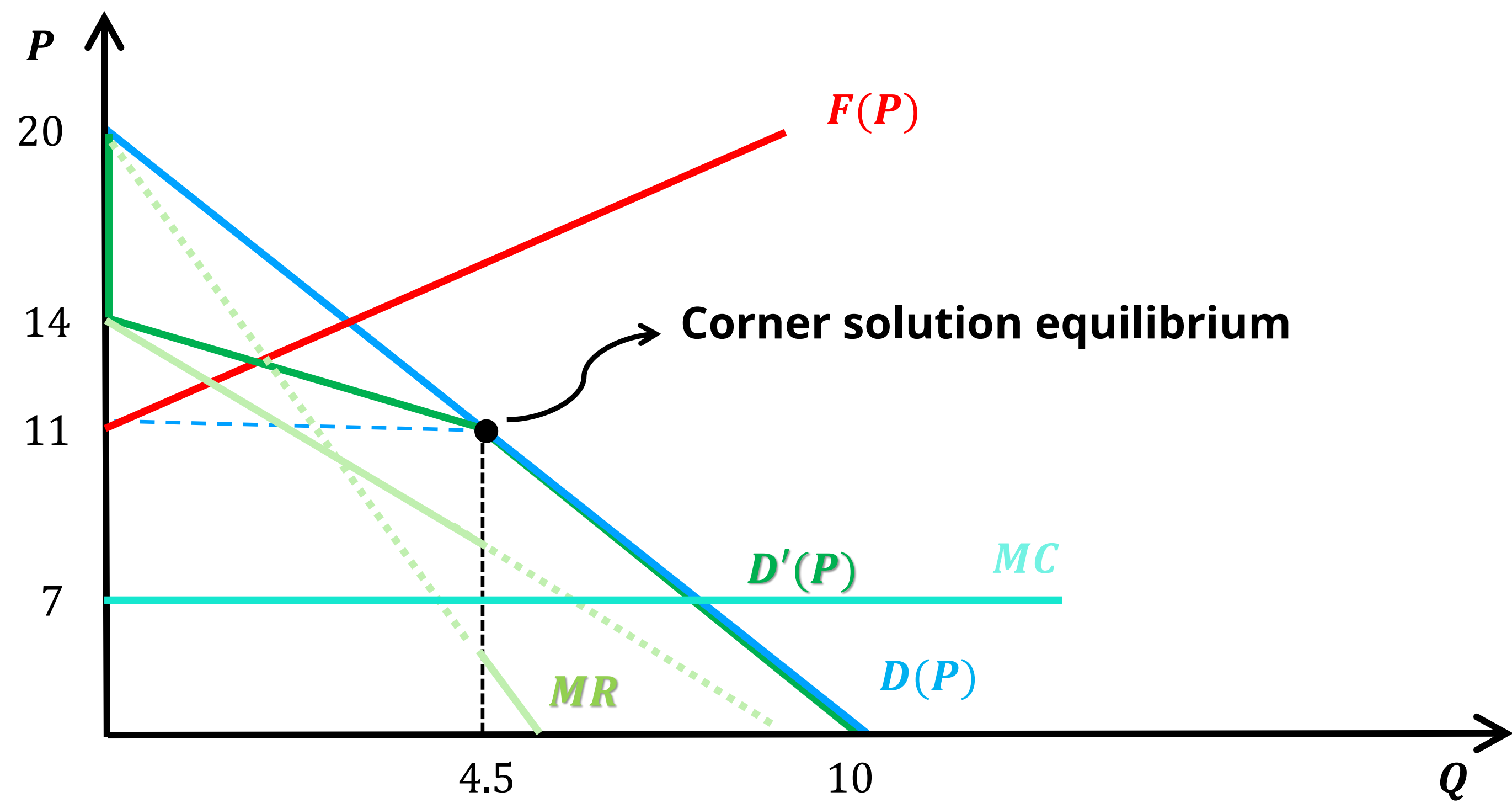
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The Dominant Firm Model

EXERCISE

Recommended readings

CABRAL, LUIS MB. INTRODUCTION TO INDUSTRIAL ORGANIZATION. MIT PRESS, 2017.

- ✓ Chapter 4.2: Sequential Games: Commitment and Backward Induction
- ✓ Chapter 5.1: Monopoly (Section: Dominant Firm)