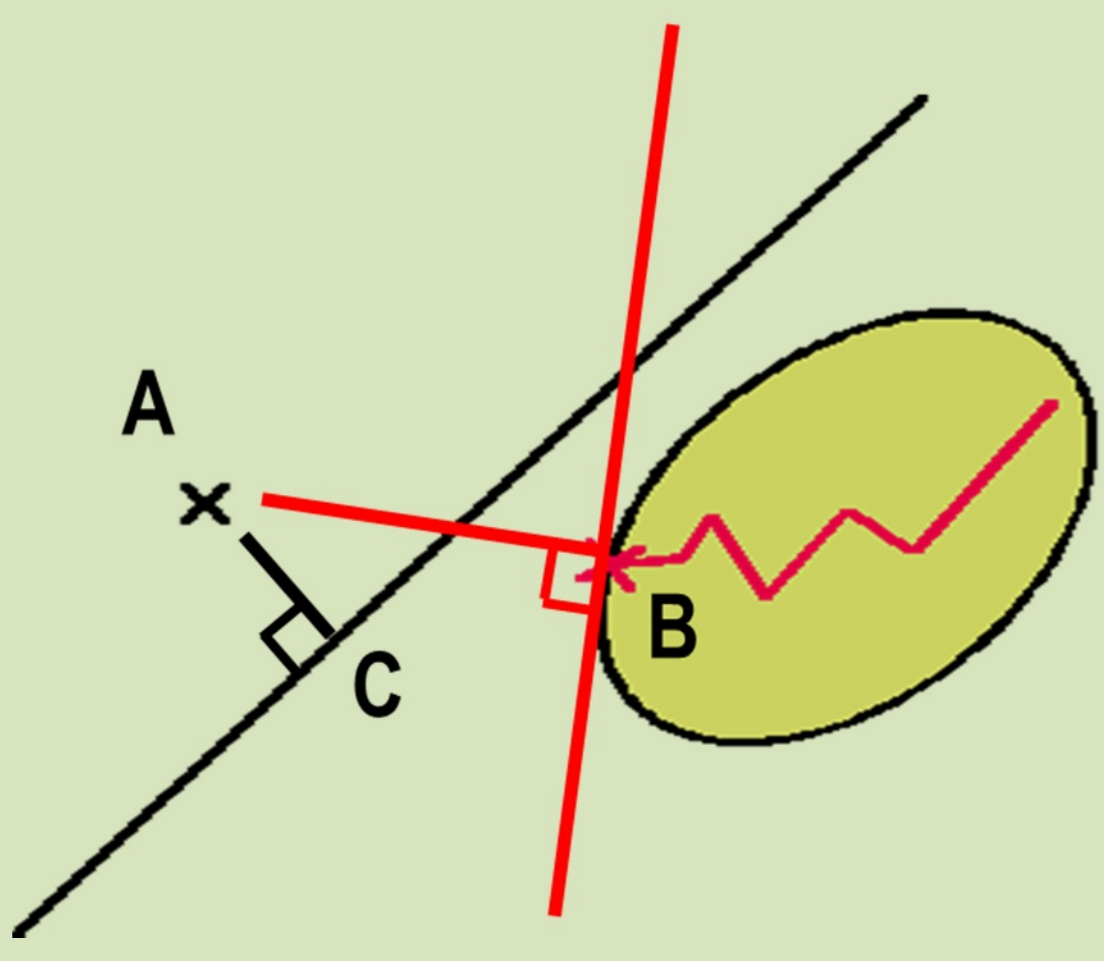
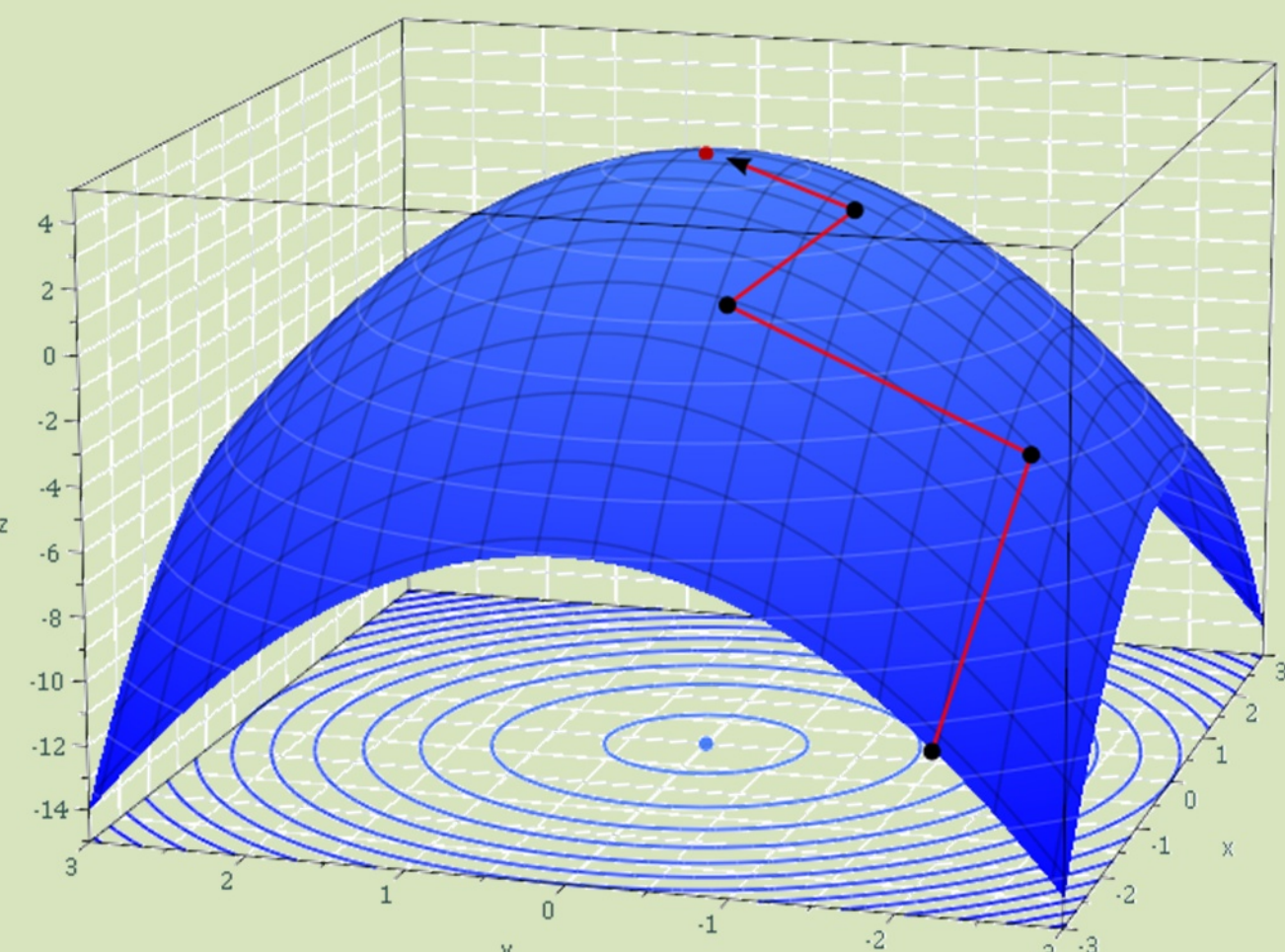


# OPTIMIZATION

## courses

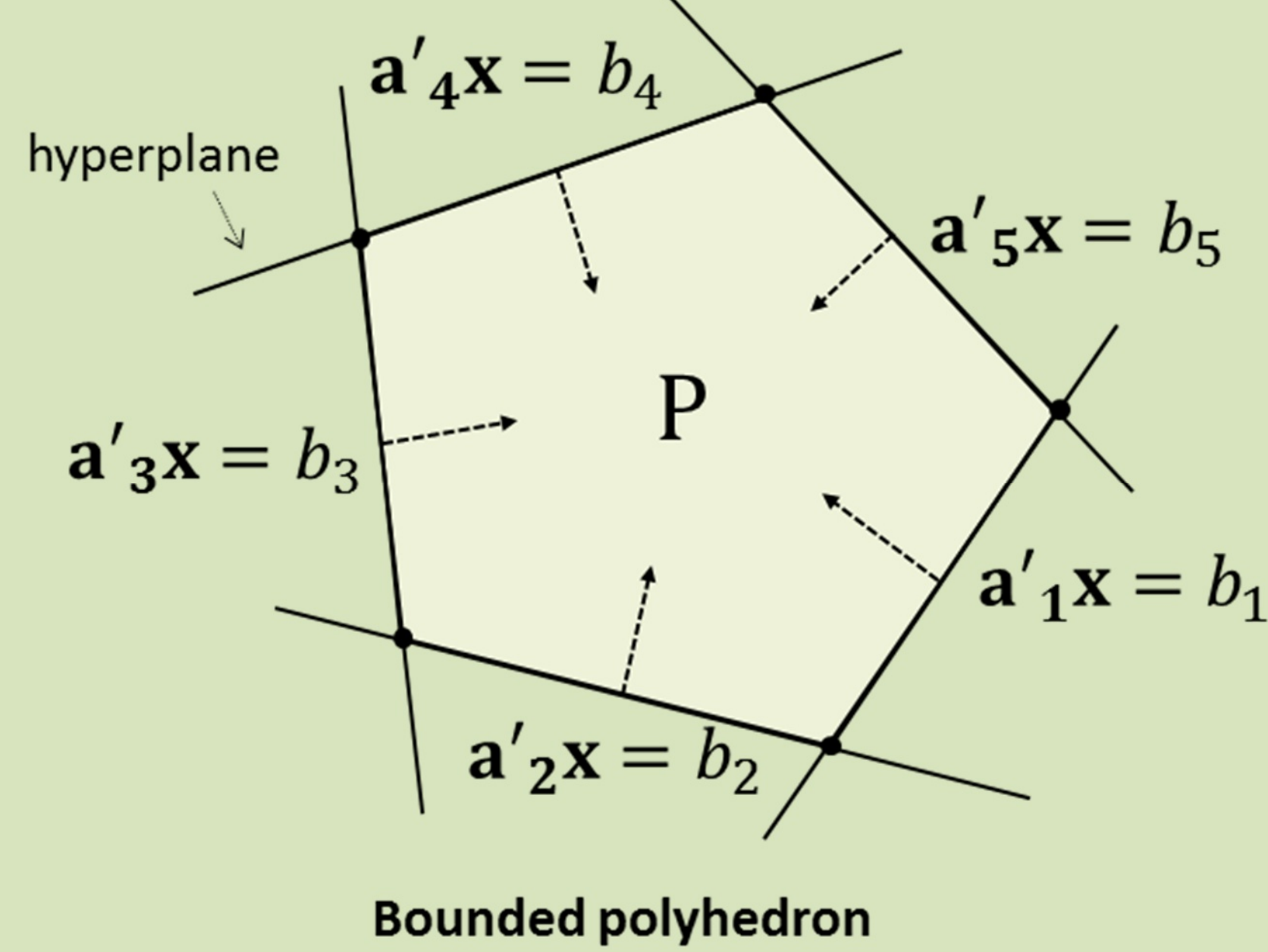
### Introduction to optimization



duality theory

### Linear programming

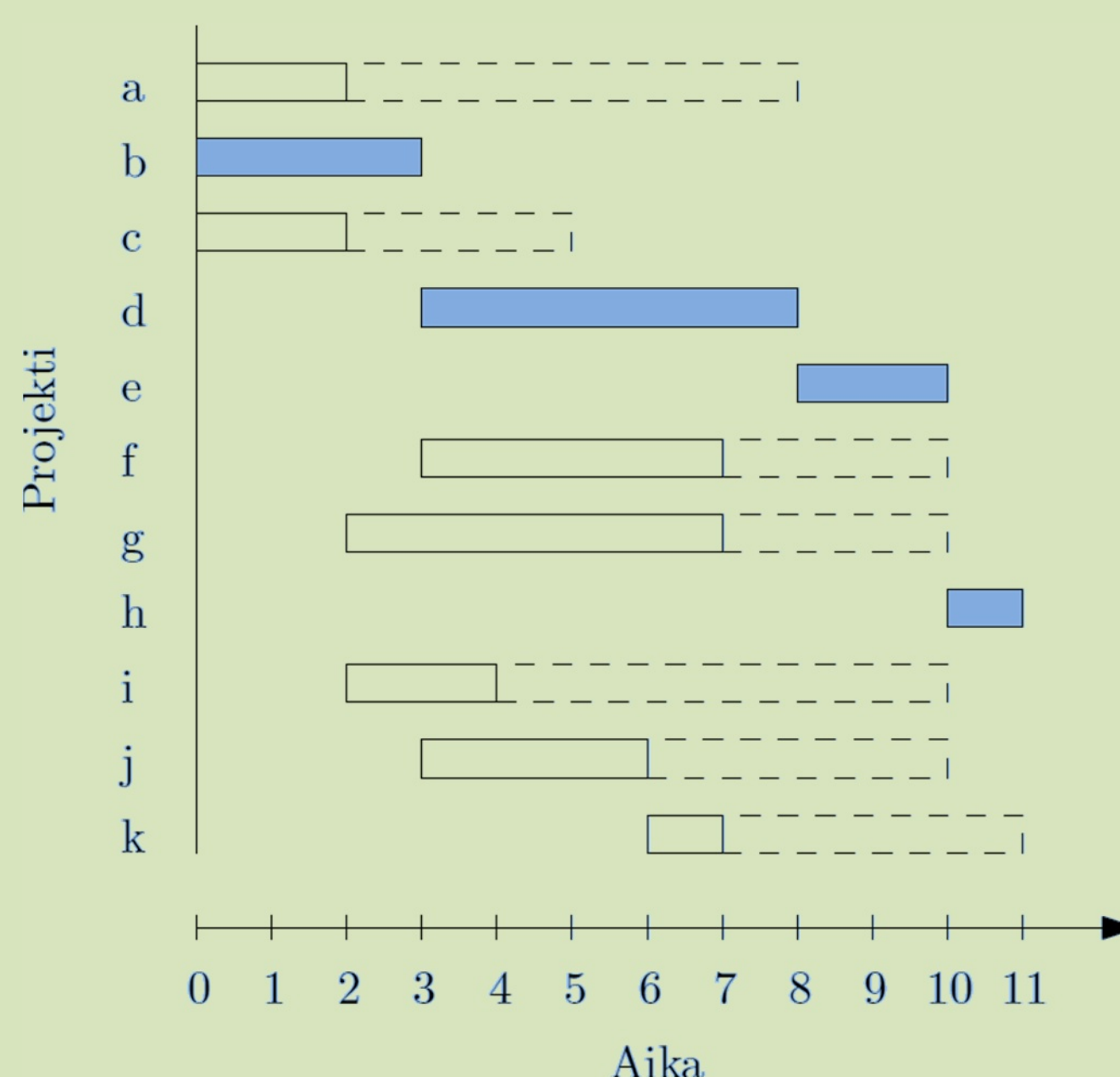
#### modeling and theory



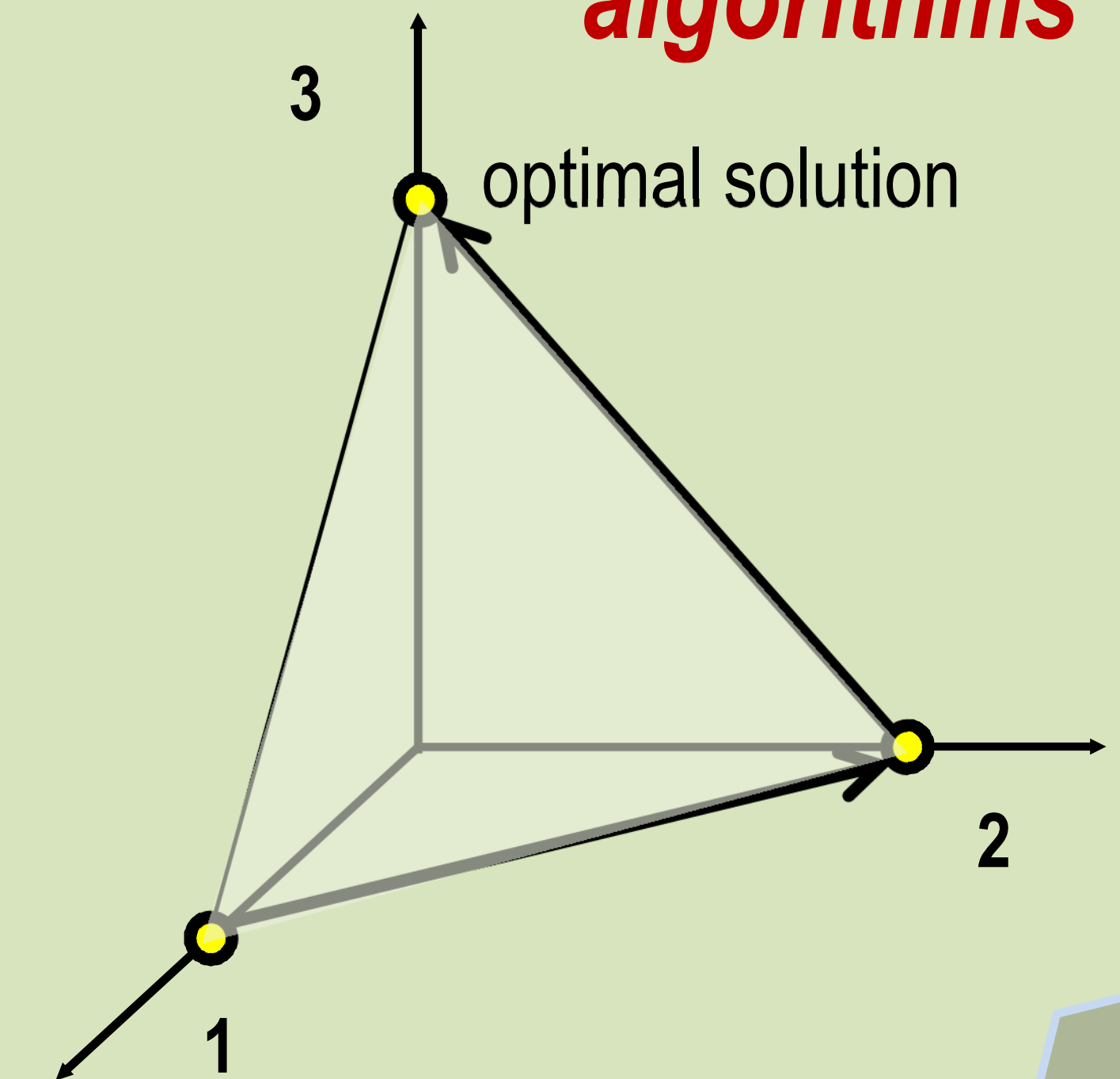
Bounded polyhedron

Unbounded polyhedron

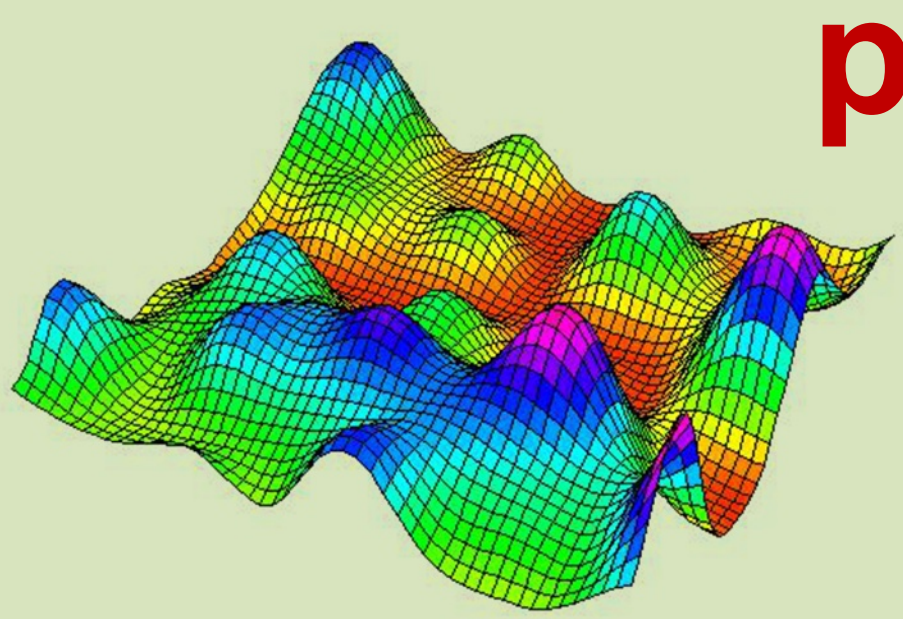
#### applications



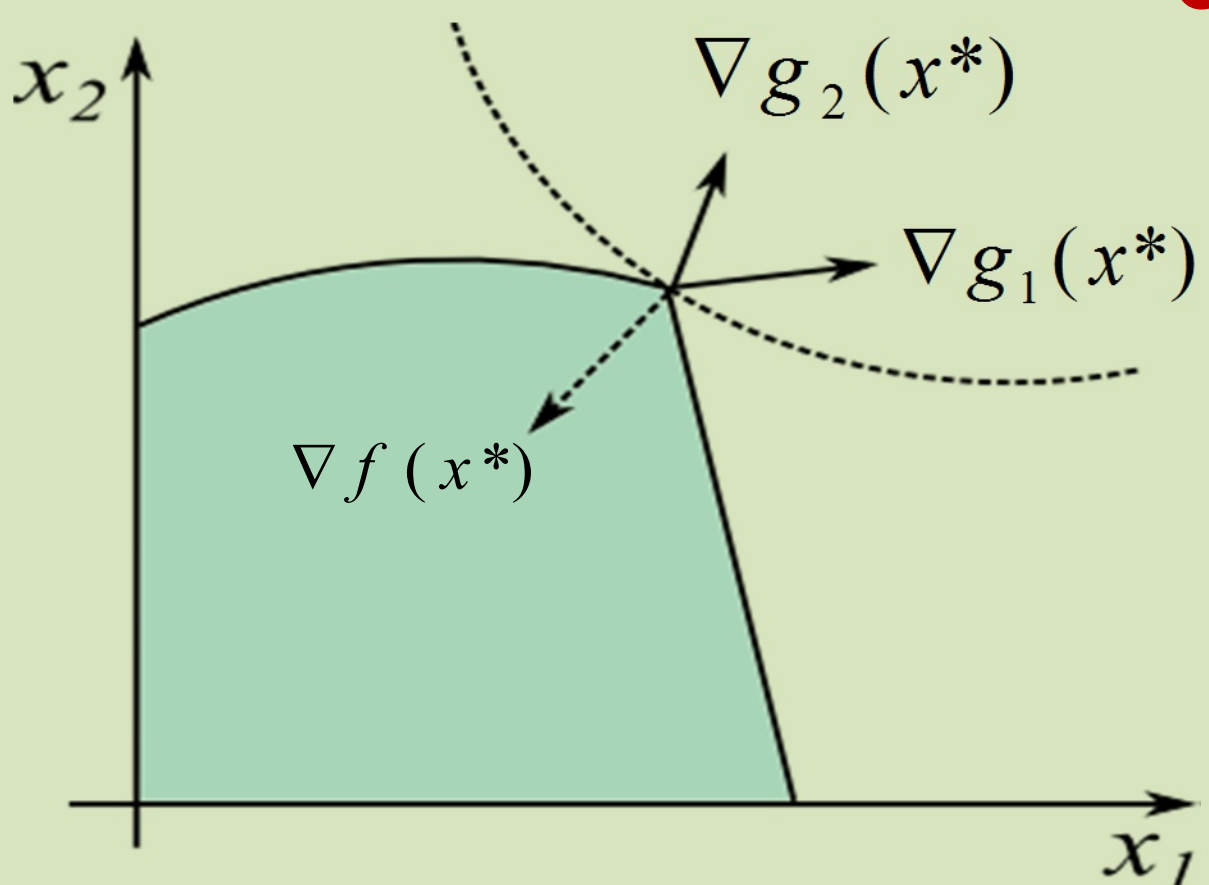
#### algorithms



### Nonlinear programming

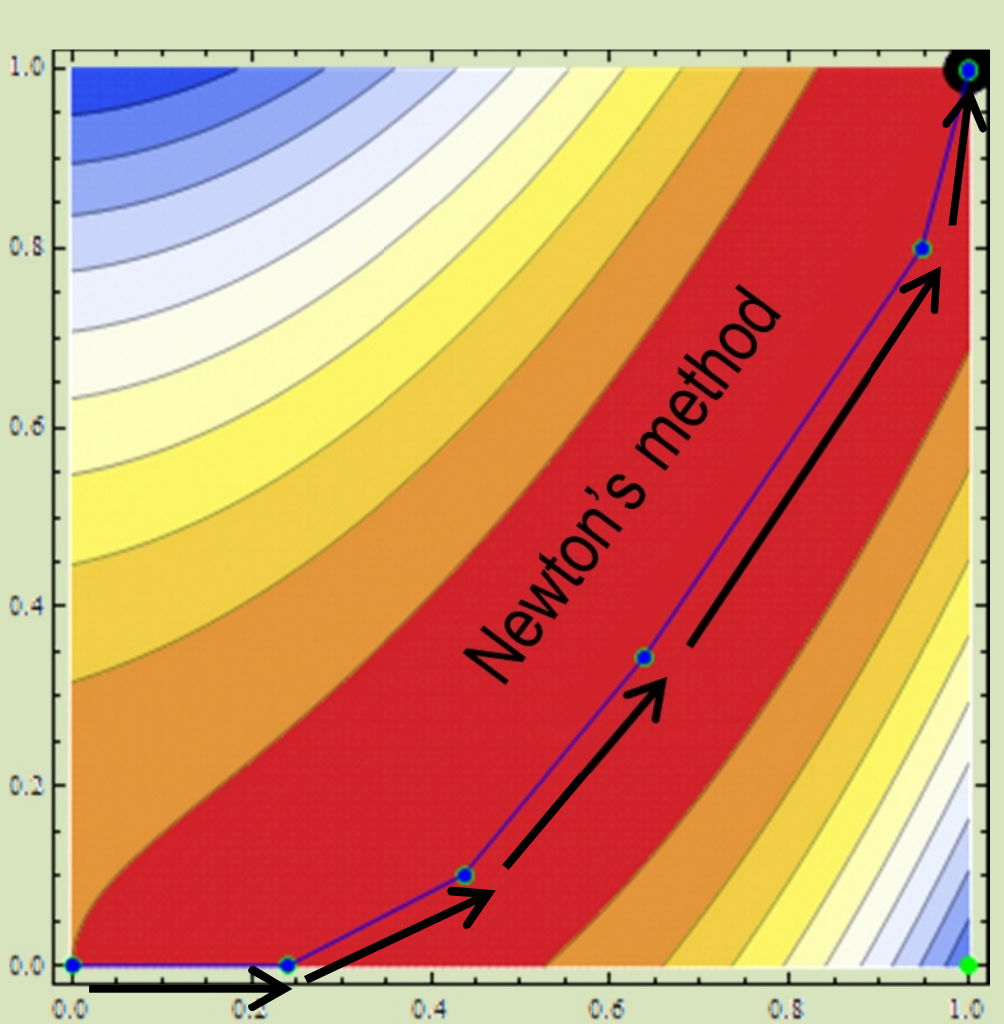
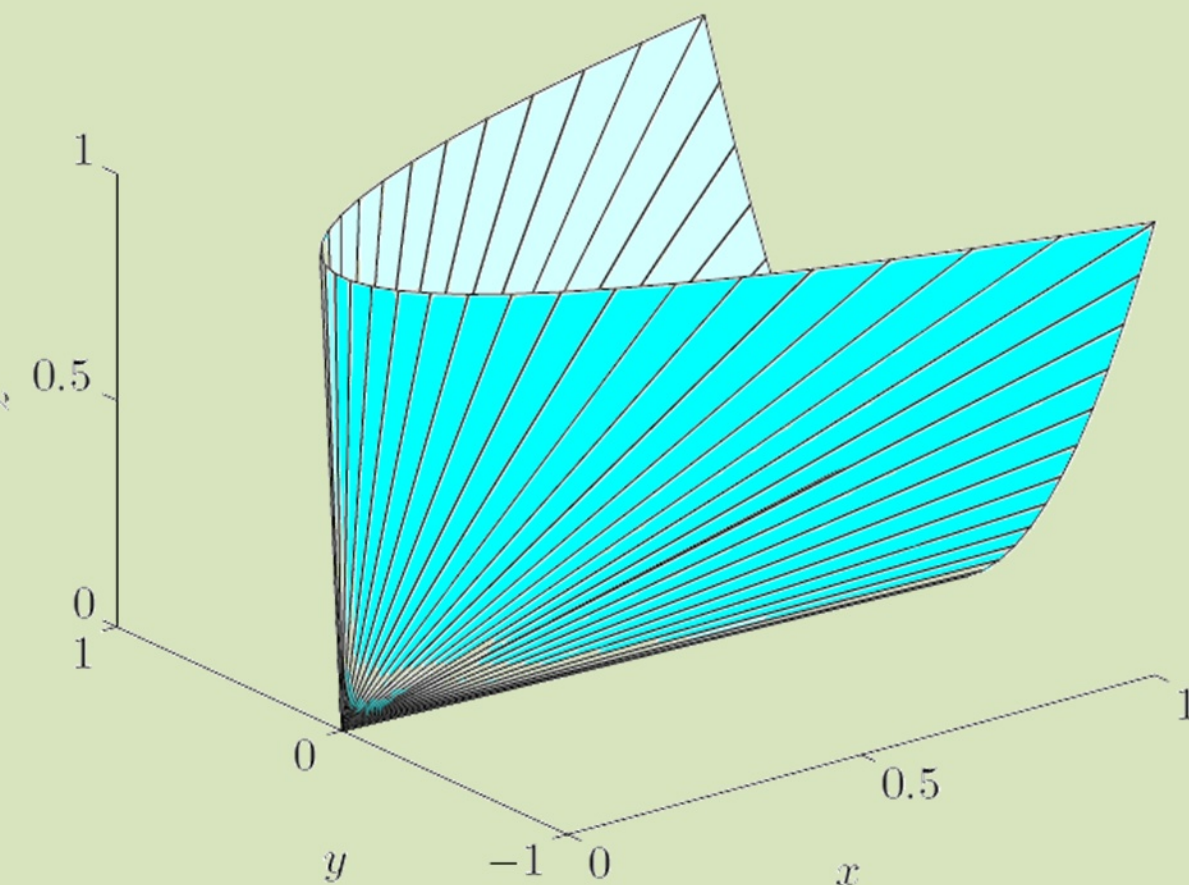


#### optimality conditions



$$-\nabla f(x^*) = \lambda_1 \nabla g_1(x^*) + \lambda_2 \nabla g_2(x^*)$$

#### generalized convexity



#### numerical algorithms

### Dynamic optimization

#### optimal macroeconomical stabilization

$$x(k+1) = Ax(k) + B_1 u(k) + B_2 v(k)$$

$$u(k) \triangleq r(k+1) - r(k)$$

$$v(k) \triangleq D(k+1) - D(k)$$

we can express the losses (4) and (5) over a planning horizon of  $N$  time stages by

$$J_r = \frac{1}{2} \sum_{k=0}^{N-1} [x^T(k) Q_r x(k) + R_{11} u^2(k) + R_{22} v^2(k)] \quad (8)$$

$$J_D = \frac{1}{2} \sum_{k=0}^{N-1} [x^T(k) Q_D x(k) + R_{11} u^2(k) + R_{22} v^2(k)] \quad (9)$$

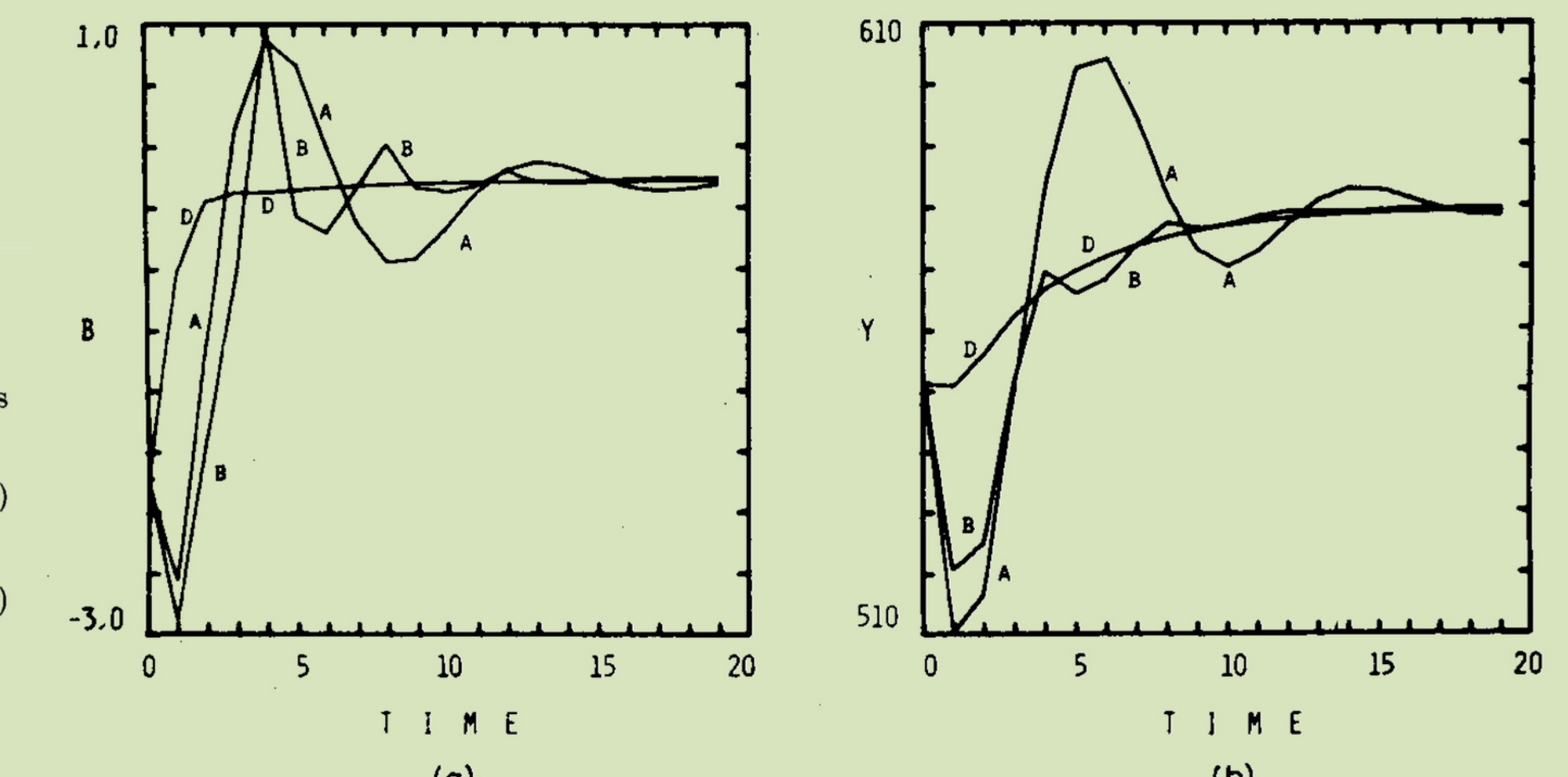
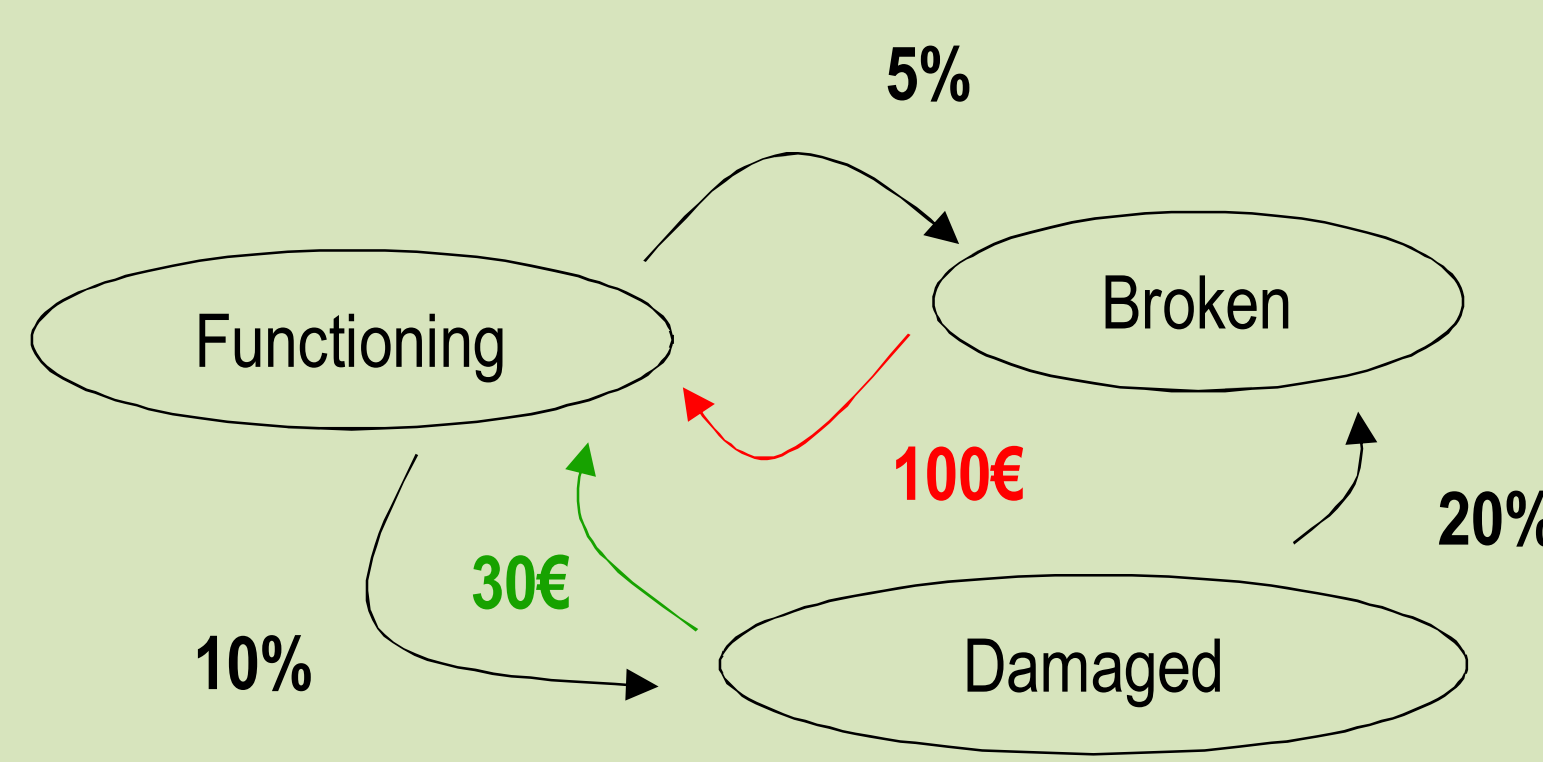
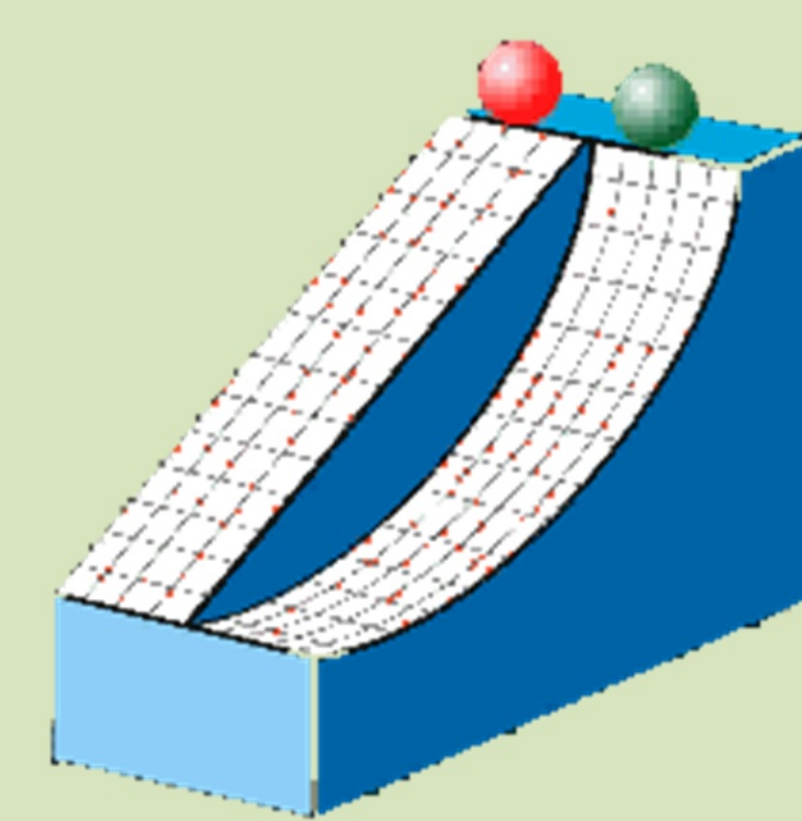


Figure 5. Transients for different updating intervals of the fiscal policy with exchanged assignments, runs A, B and D.

#### optimal maintenance planning



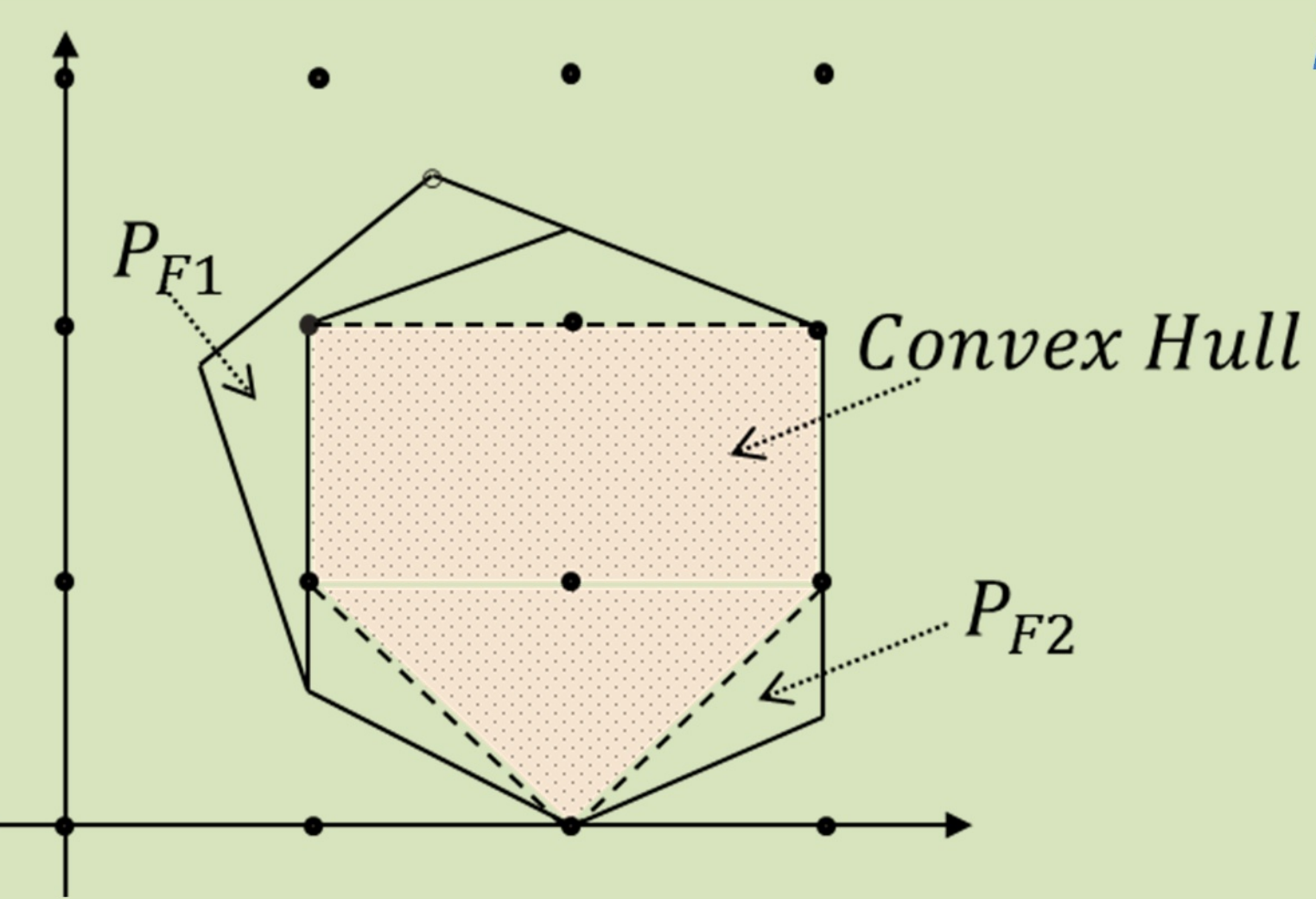
#### optimal design



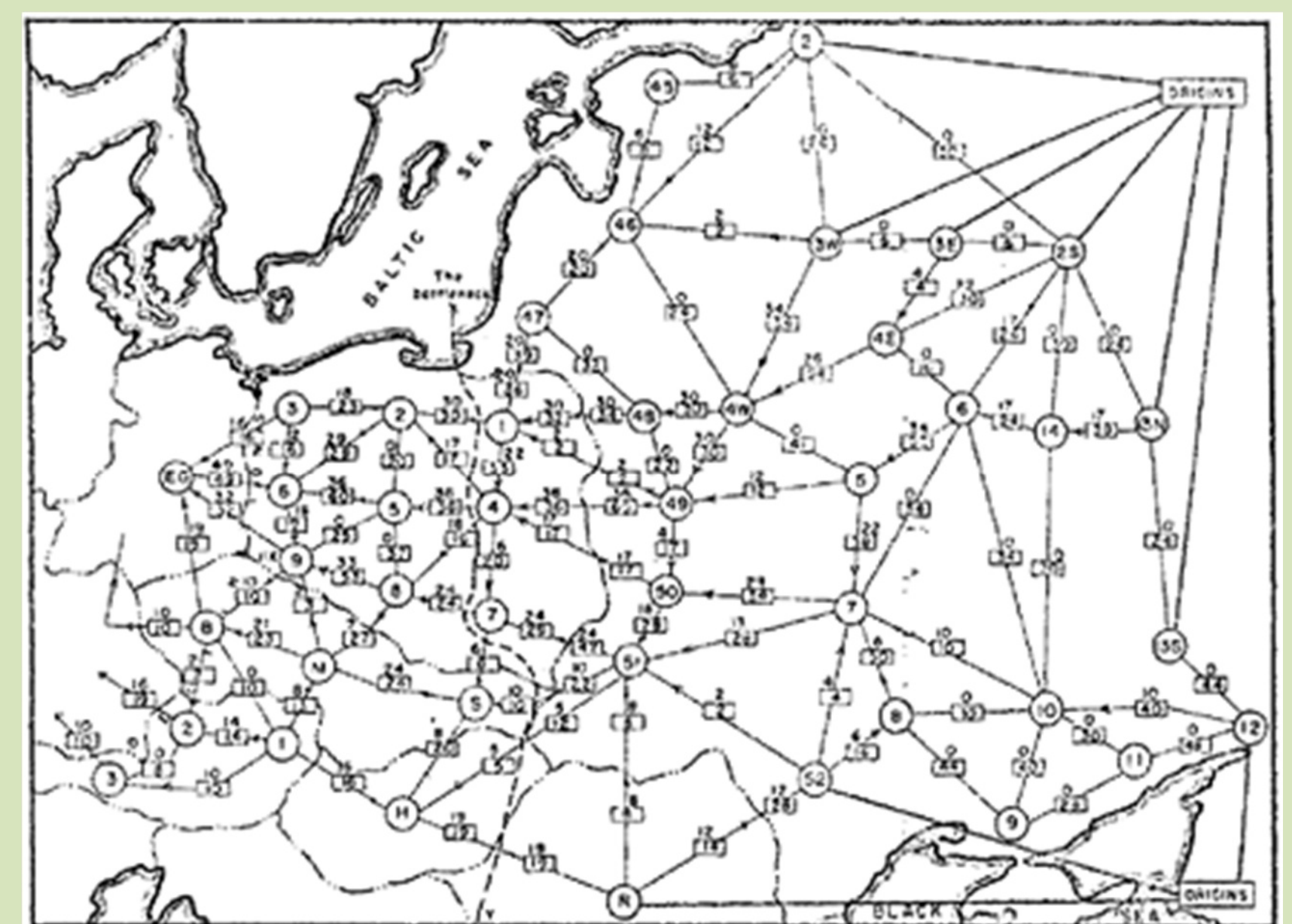
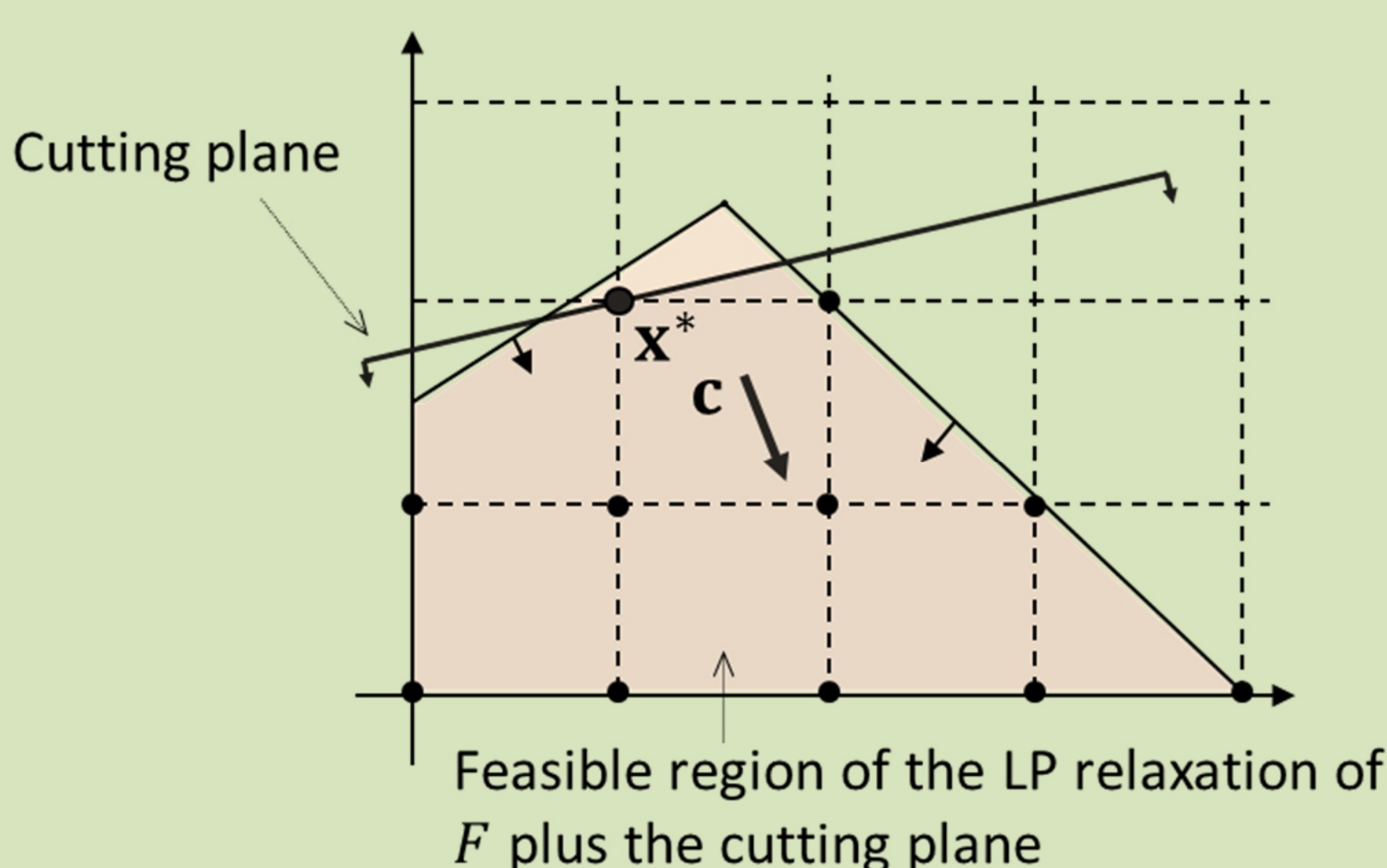
### Integer optimization

#### combinatorial optimization

#### applications



#### methods

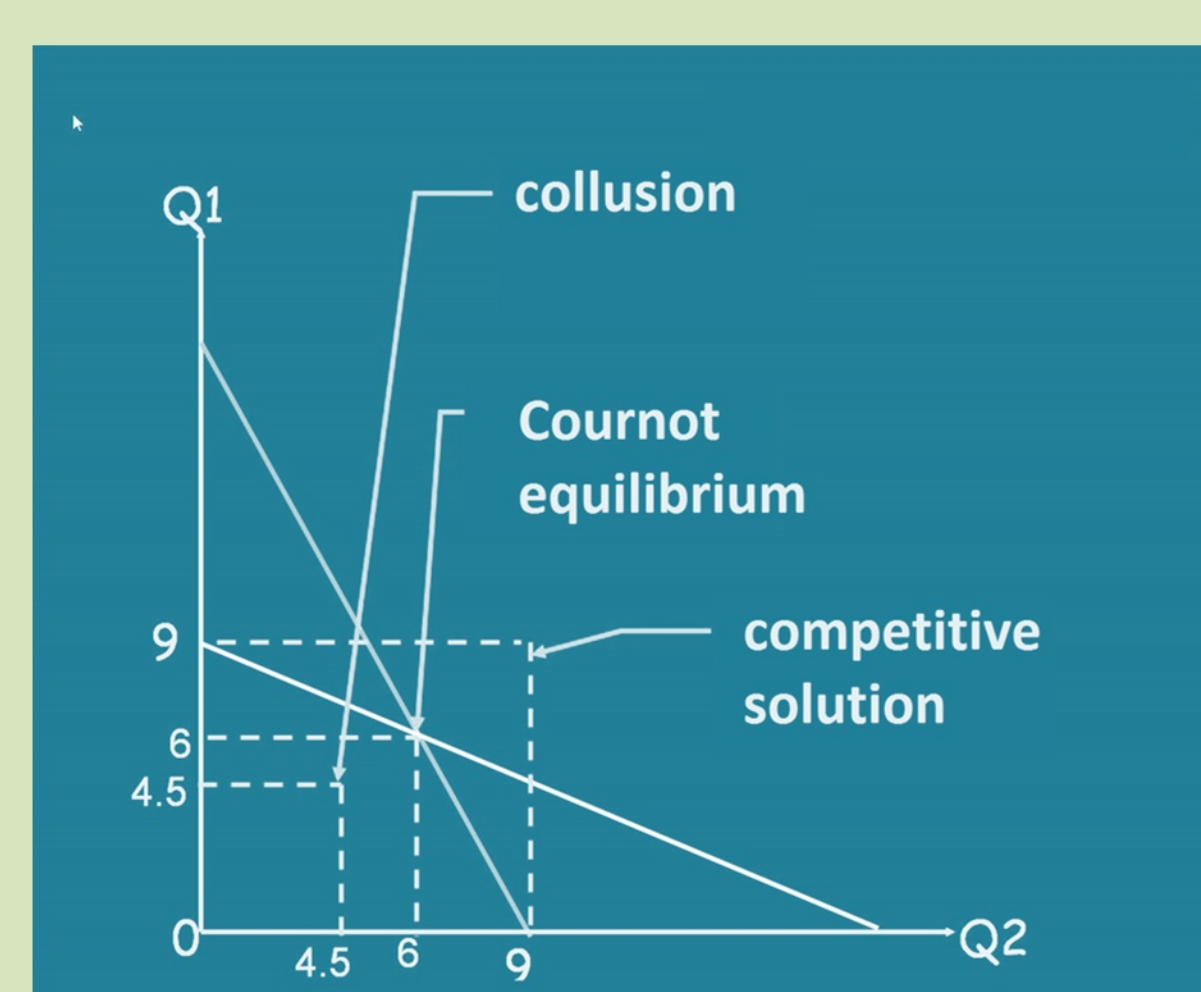


#### network optimization

### courses and instructors

- Optimoinnin Perusteet: MS-C2105, Prof. Harri Ehtamo
- Linear Programming: Mat-2.3139, Prof. Enrico Bartolini
- Nonlinear Programming: Mat-2.3140, PhD Matteo Brunelli
- Dynaaminen optimointi: Mat-2.3148, TkD Kimmo Berg
- Integer Programming: Mat-2.4148, Prof. Enrico Bartolini
- Optimoinnin Matemaattinen Teoria: Mat-2.4144, Prof. Harri Ehtamo
- Multiple Criteria Optimization: Mat-2.4153, PhD. Matteo Brunelli
- Peliteoria: Mat-2.3152, Prof. Harri Ehtamo

### Game theory



#### duopoly game

	Opera	F.ball
Opera	4, 1	0, 0
F.ball	0, 0	1, 4

#### battle of the sexes game