Note of MPC

Diagram

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Text, letter

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The MPC will try to find the best control sequence over the prediction horizon 𝑁𝑝.

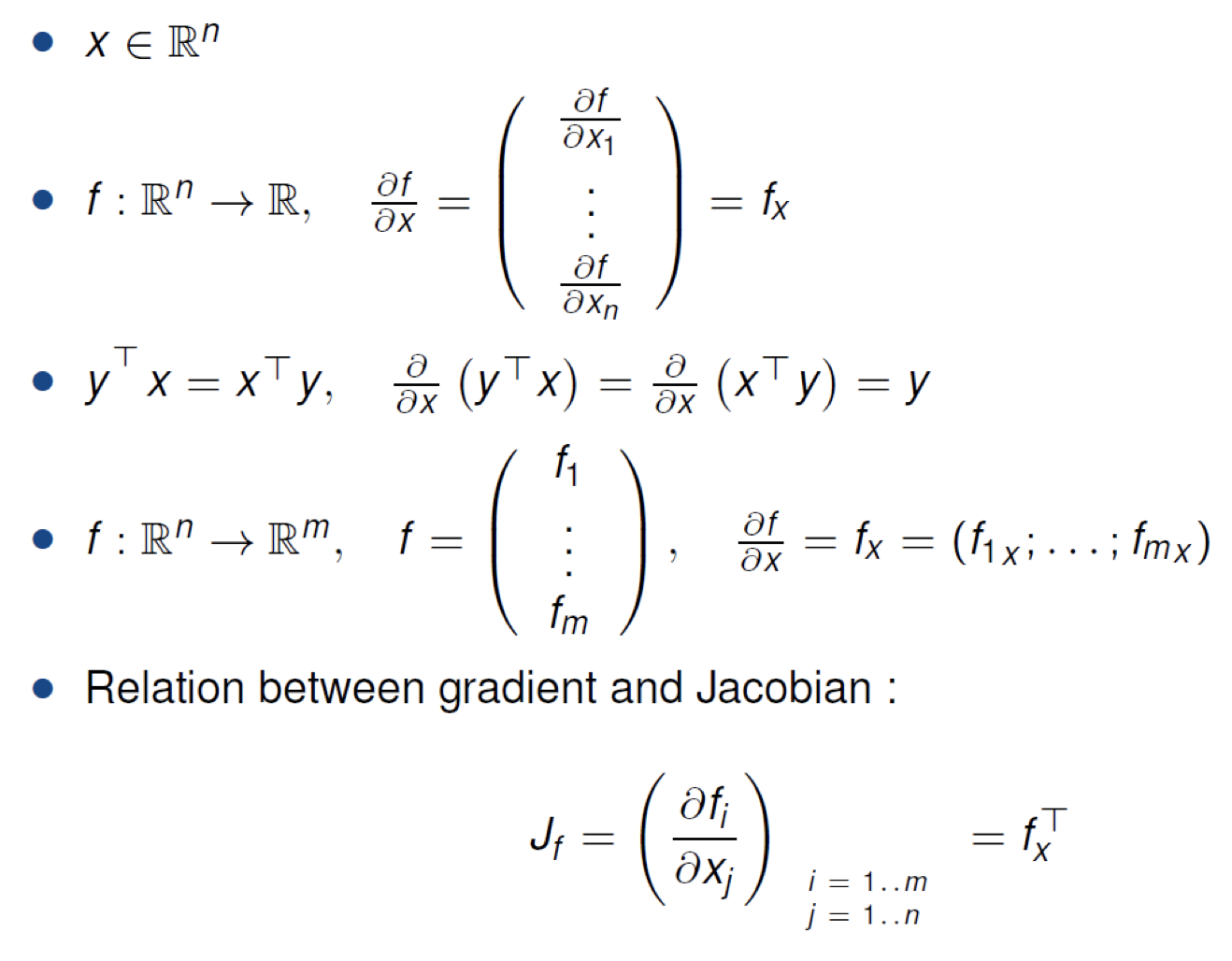
## 3 Rules:

RULE 1 : PREDICTION IN THE CONTROLLER;

RULE 2 : OPTIMIZATION IN THE LOOP;

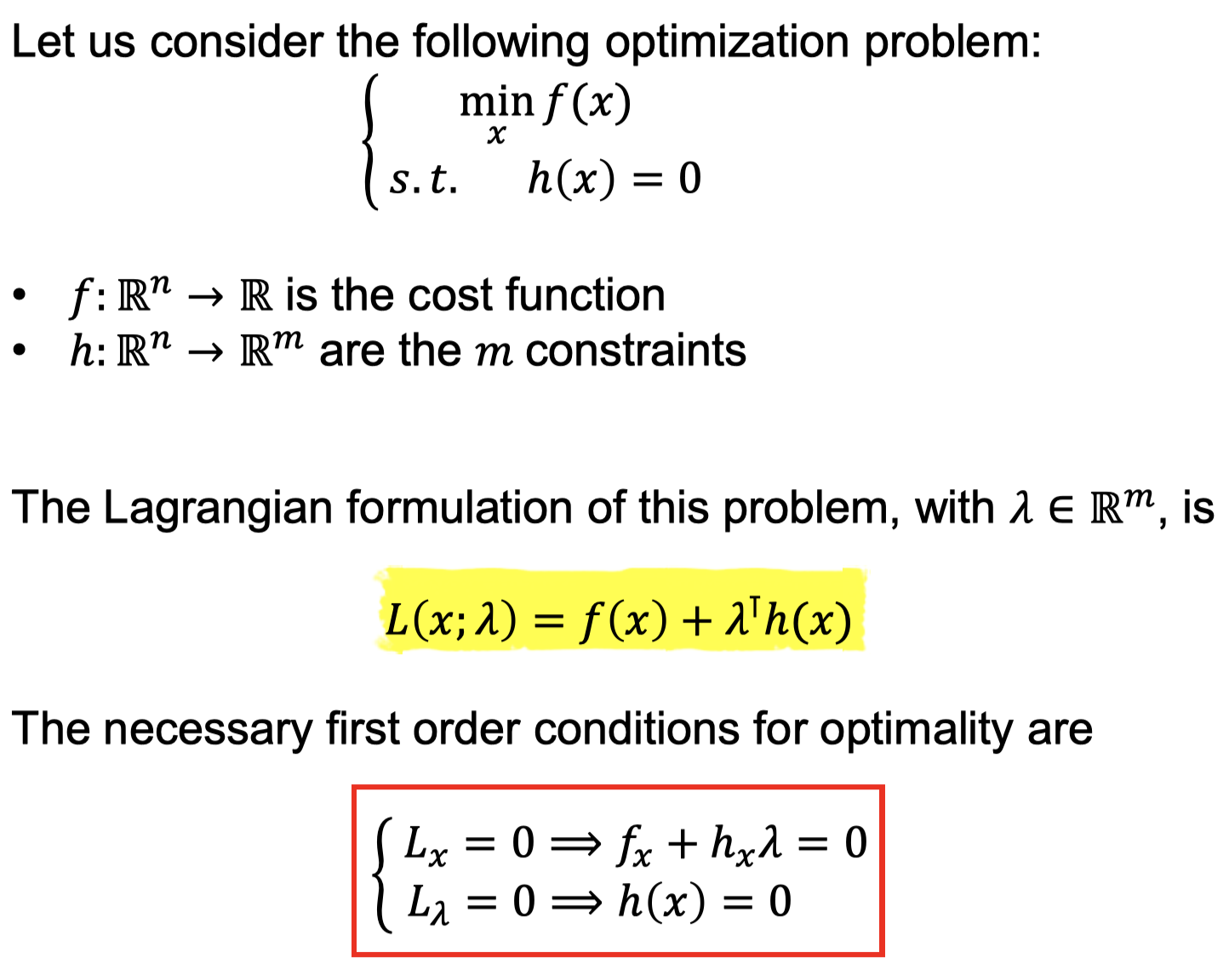
RULE 3 : RECEDING HORIZON PRINCIPLE.

## Matrix calculus:

Text, letter

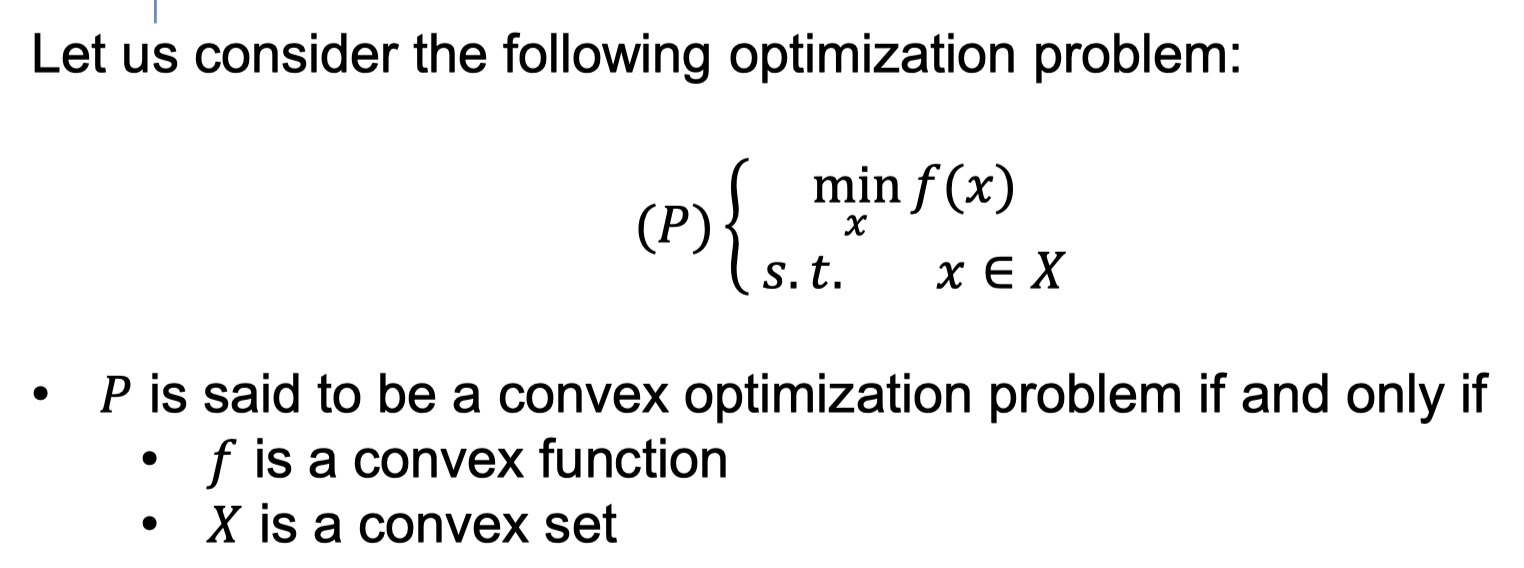
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## OPTIMIZATION UNDER CONSTRAINTS: LAGRANGE RELAXATION



## Convexity

The optimization problem is convex, with respect to the optimization variables.



## Convexity: 1st and 2nd order conditions

Chart, line chart

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For quadratic function, the Hessian **is Symmetric Positive Definite.**

## D-LQR:

## Text Description automatically generated

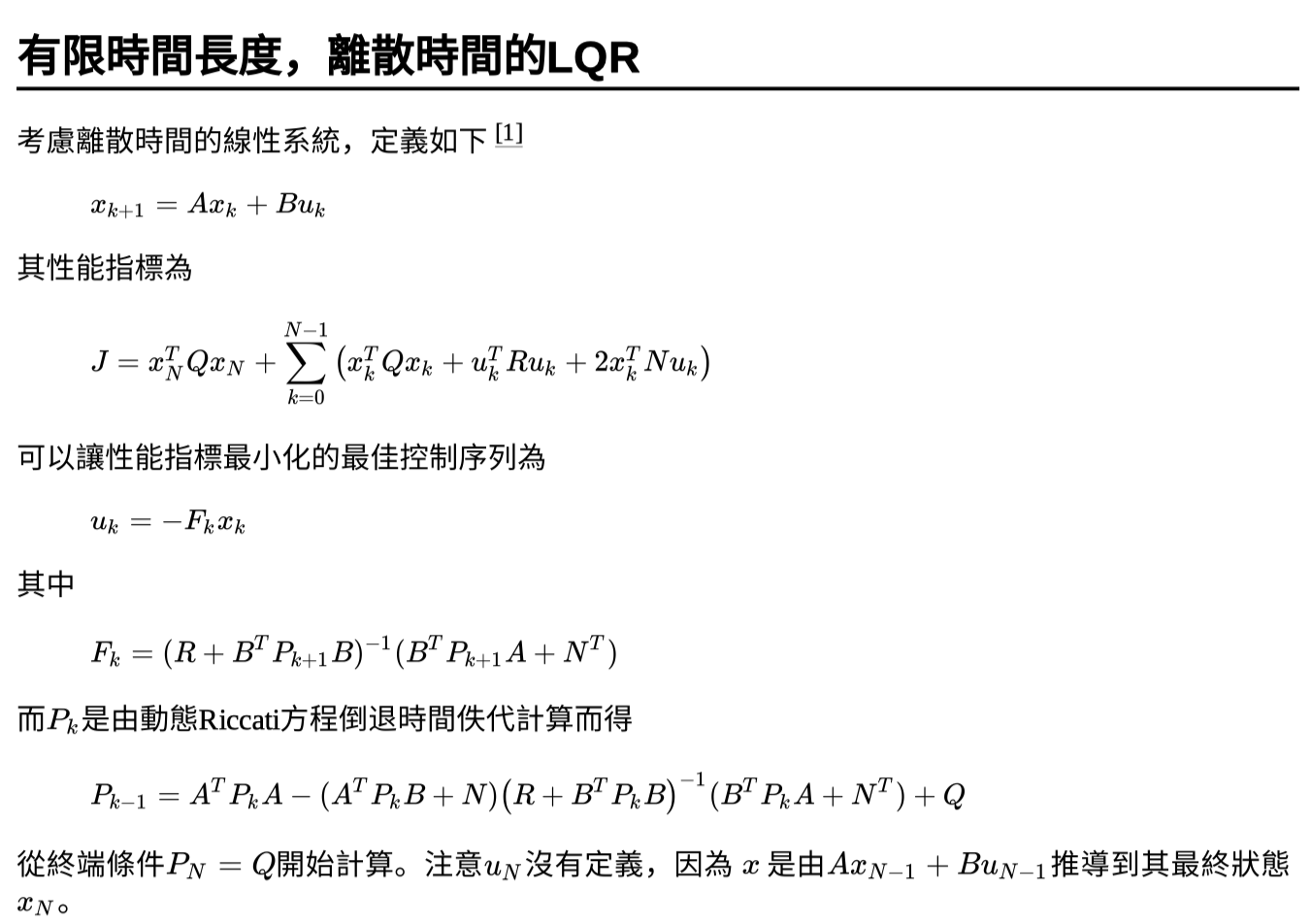
最优控制理論主要探討的是讓动力系统以在最小成本來運作，若系統動態可以用一組线性微分方程表示，而其成本為二次泛函，這類的問題稱為線性二次（LQ）問題。此類問題的解即為線性二次調節器（英語：linear–quadratic regulator），簡稱LQR。

LQR是回授控制器，方程式在後面會提到。LQR是LQG（線性二次高斯）問題解當中重要的一部份。而LQG問題和LQR問題都是控制理论中最基礎的問題之一。

**Assumptions**:

Graphical user interface, text, application, chat or text message

Description automatically generated



## 3 ways to stabilize a system, using a state feedback

A picture containing table

Description automatically generated