Lecture 4
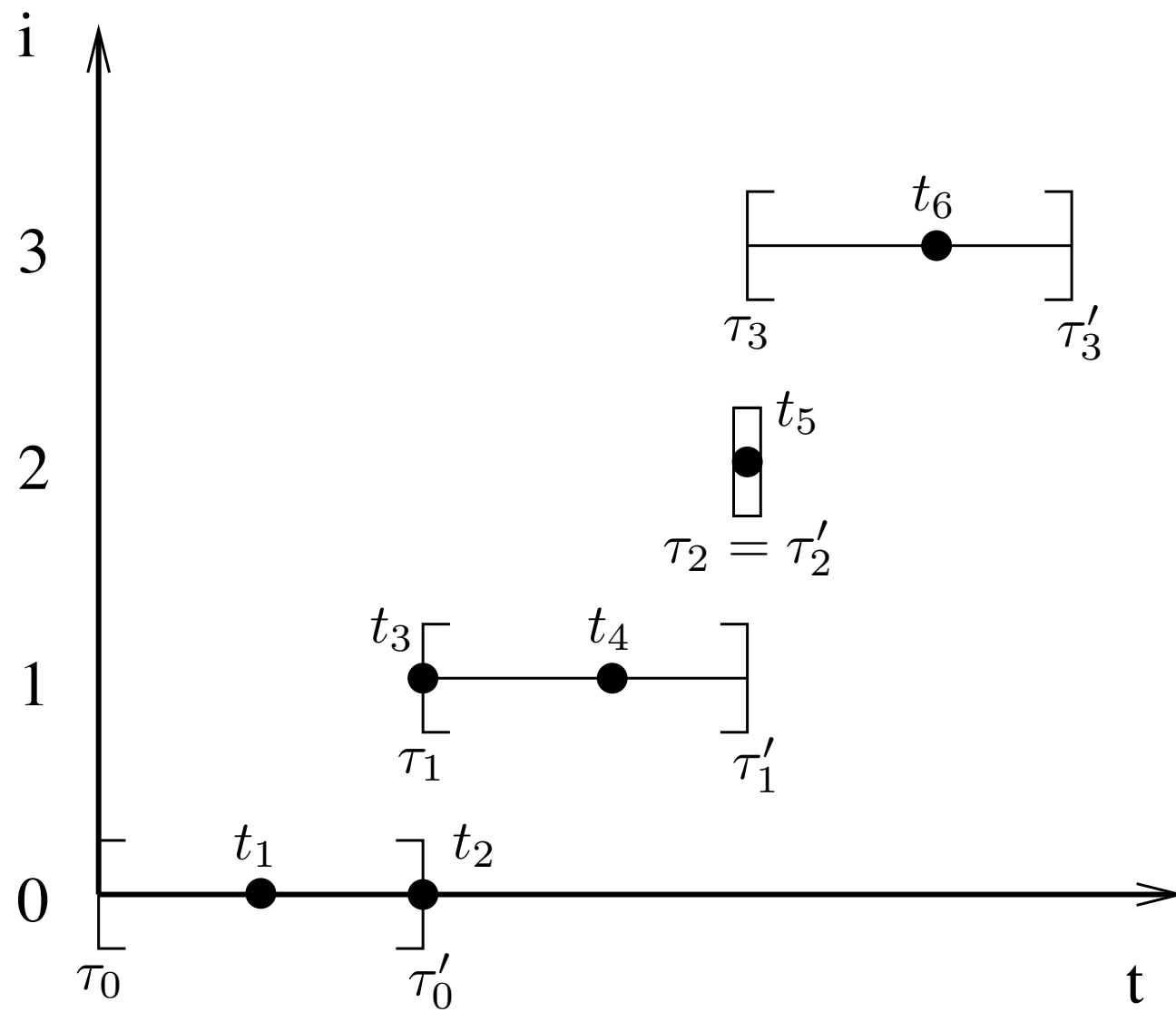
Review (time sets)
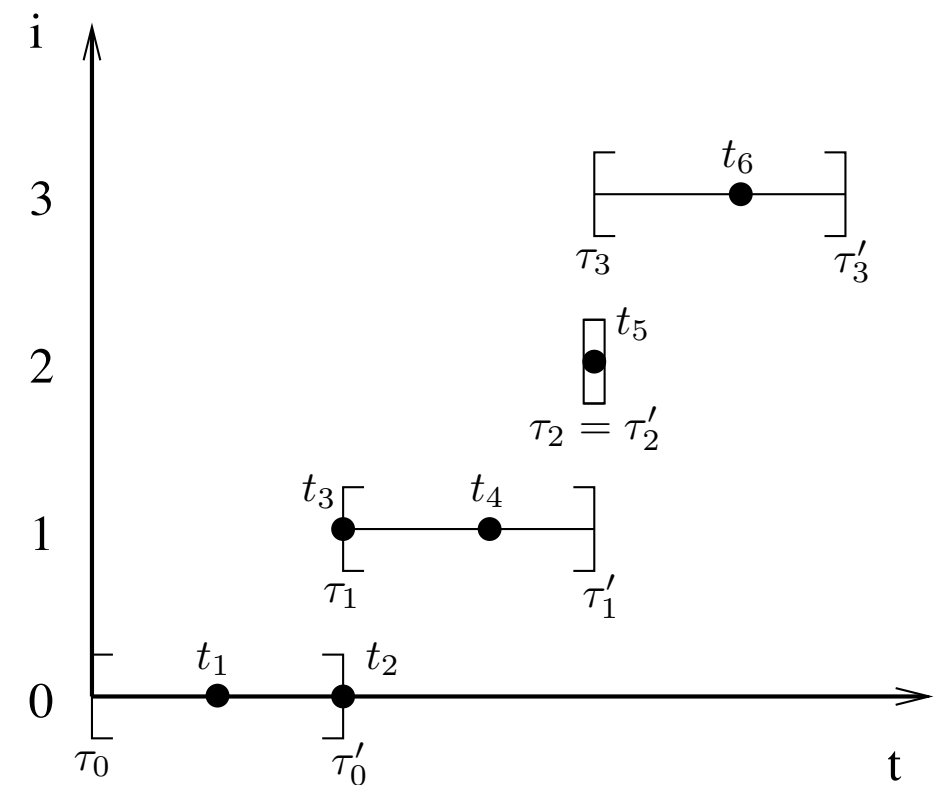
Review (Hybrid trajectory - (τ, q, x))

A hybrid trajectory over a set of variables $Q \times X$ is a triple (τ, q, x) consisting of a hybrid time set $\tau = \{I_i\}_{i=0}^{N}$ and two sequences of functions $q = \{q_i(\cdot)\}_{i=0}^{N}$ and $x = \{x_i(\cdot)\}_{i=0}^{N}$ with $q_i(\cdot) : I_i \to Q$ and $x_i(\cdot) : I_i \to \mathbb{R}^n$.
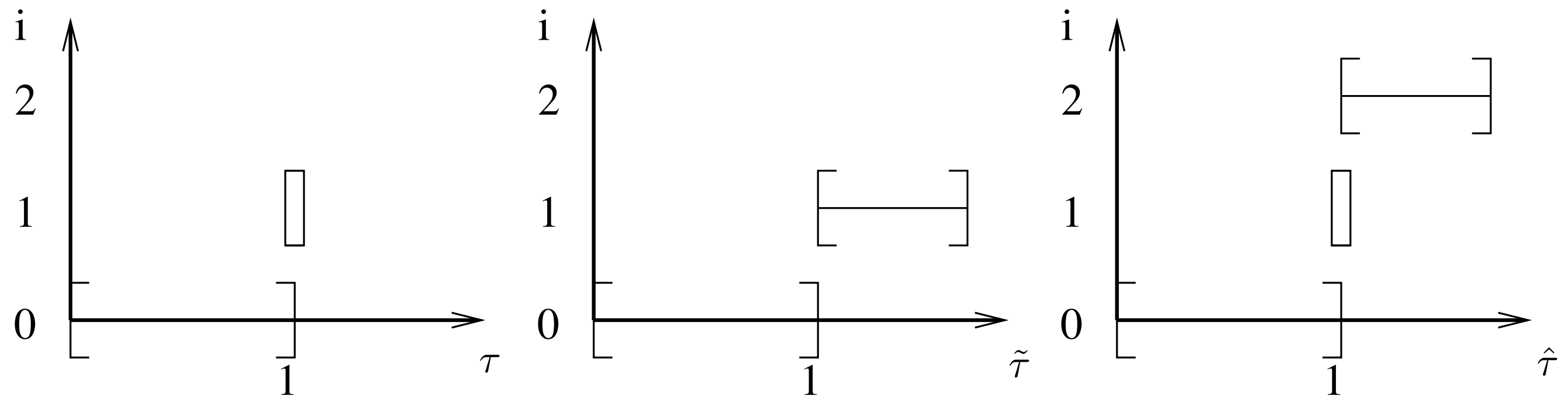
Review (Hybrid Execution)

- Initial condition: $(q_0(0), x_0(0)) \in \text{I}nit.$

Review (prefix)

$$\tau \sqsubseteq \hat{\tau} \text{ and } \tau \sqsubseteq \tilde{\tau}.$$

A way to define what time set is "shorter"

Review (classification)

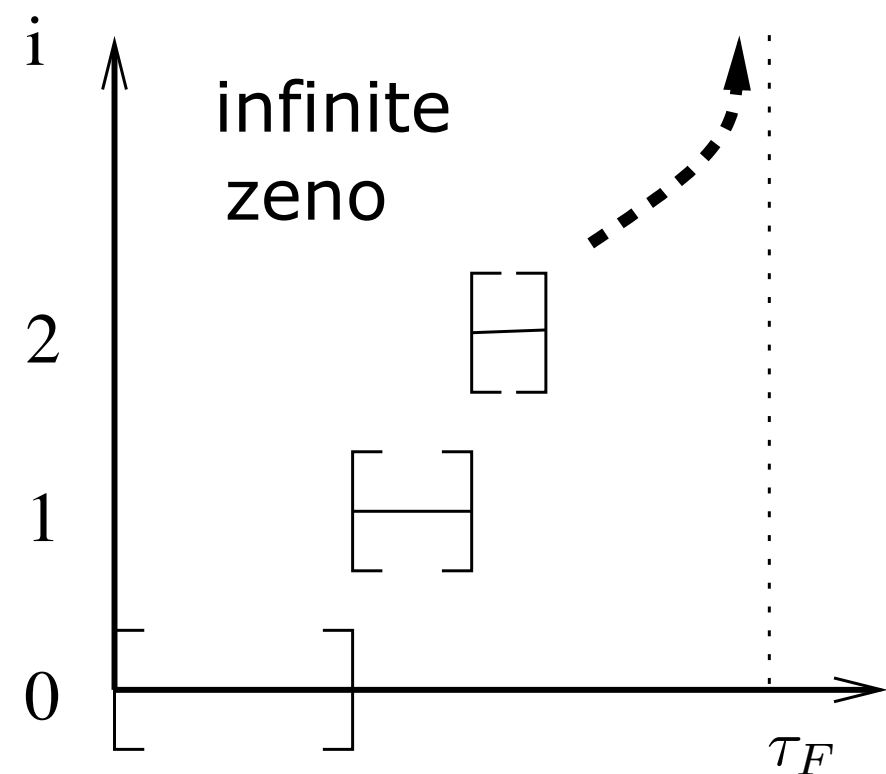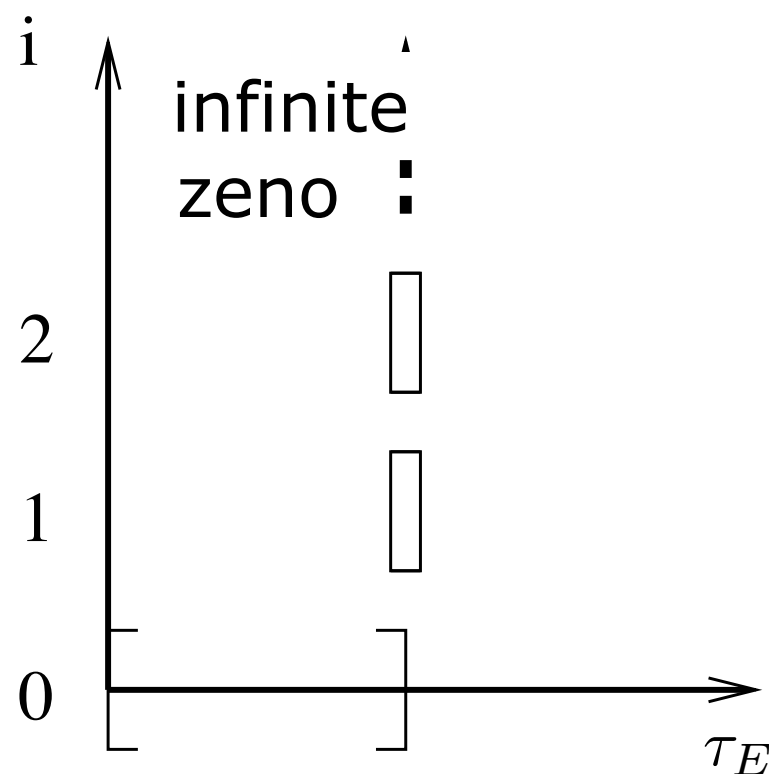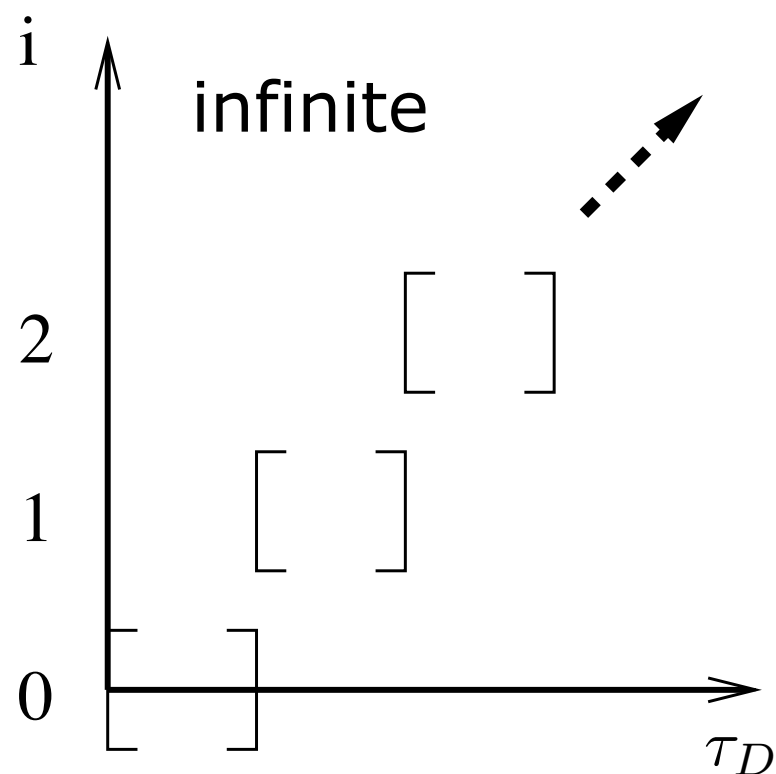**Finite**, *if τ is a finite sequence and the last interval in τ is closed.*
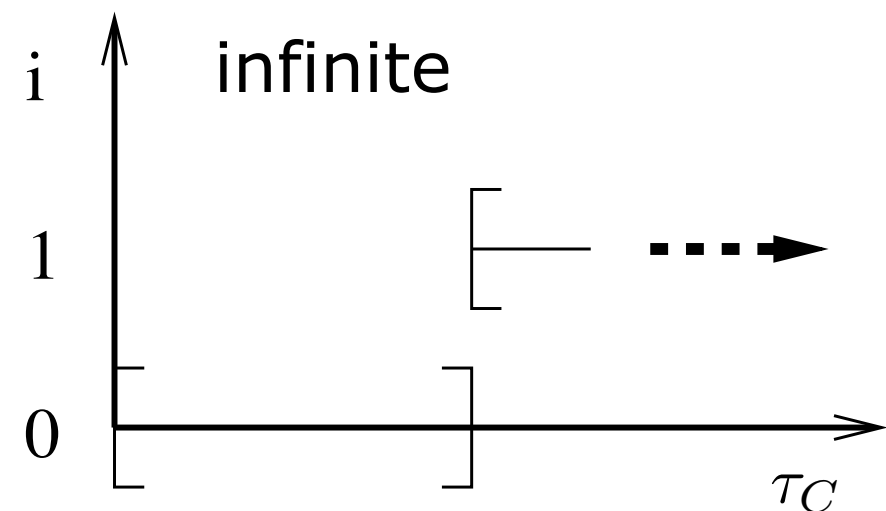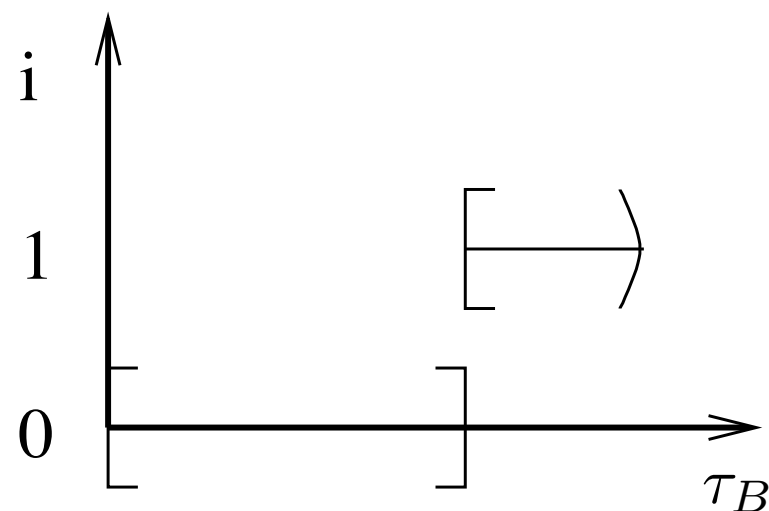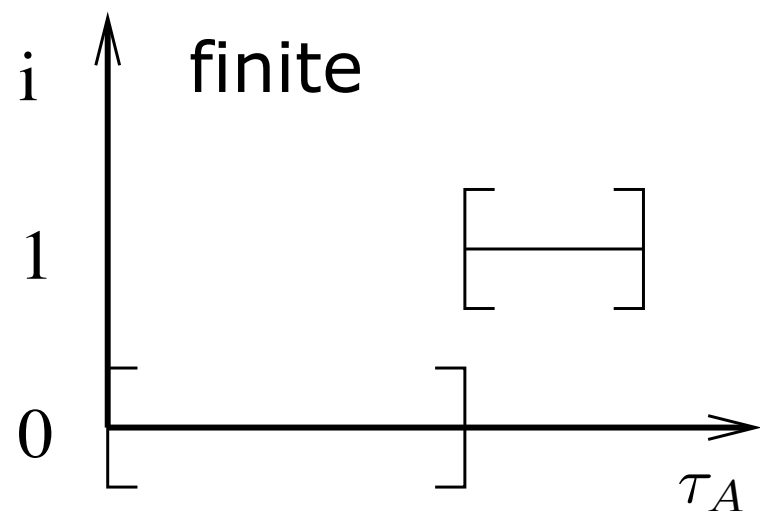
Infinite, *if τ is an infinite sequence, or if the sum of the time intervals in τ is infinite, i.e.*

$$\sum_{i=0}^{N}(\tau_i' - \tau_i) = \infty.$$

Zeno, *if it is infinite but $\sum_{i=0}^{\infty}(\tau_i' - \tau_i) < \infty$.*

Maximal *if it is not a strict prefix of any other execution of H.*

Review (classification)

maximal: if it is not a strict prefix of any other execution of H

infinite execution → maximal execution

Today

- Lemma 1 (Non-blocking)

- Lemma 2 (Deterministic)

- Local existence of solutions + uniqueness

- Next class: Stability of switched systems

blocking + non-determinstic

$x :\in (-\infty, 0]$

q

$\dot{x} = 1$

$x \leq 0$

$x \leq -2$

q'

$\dot{x} = -1$

$x \leq 0$

$x \leq -3$

$x :\in (-\infty, 0]$