#### Westfälische Wilhelms-Universität Münster

#### Übung Modellierung und Analyse von Dynamischen Systemen, WiSe 17/18

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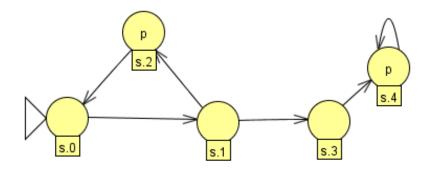
Autoren: Edenfeld, Lemke, Moser, Schinke Blatt 2

## Aufgabe 1

 $\phi_1: true \mathcal{U} \mathcal{X} a$  matches to  $\pi_1$ .  $\phi_2: \mathcal{G} \mathcal{X} a$  matches to  $\pi_2$ .  $\phi_3: a \mathcal{U} a$  matches to  $\pi_3$ .  $\phi_4: a \wedge a$  matches to  $\pi_4$ .  $\phi_5: \mathcal{F} \mathcal{G} a$  matches to  $\pi_5$ .  $\phi_6: (\mathcal{X} b) \mathcal{U} a$  matches to  $\pi_6$ .

## Aufgabe 2

Counterexample:



While the CTL formulae AXAFp is accepted by the example above. The path  $s_0s_1s_3$  however is not accepted by the formulae AFAXp. Thus AXAFp and AFAXp are not equivalent.

# Aufgabe 3

$$\begin{split} \forall s_0: \mathcal{AG}(p \to \mathcal{AF}q) \\ \Leftrightarrow \forall s_0: \forall \pi = s_0 s_1 ...; \mathcal{G}(p \to \mathcal{AF}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \mathcal{G}(\neg p \lor \mathcal{AF}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \neg \mathcal{F}(p \land \neg \mathcal{AF}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \neg \mathcal{F}(p \land \exists \neg \mathcal{F}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \neg \mathcal{F}(p \land \neg \mathcal{F}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \mathcal{F}(p \land \neg \mathcal{F}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \mathcal{G}(\neg p \lor \mathcal{F}q) \\ \Leftarrow \forall s_0: \forall \pi = s_0 s_1 ...: \mathcal{G}(p \to \mathcal{F}q) \end{split}$$