Aufgabe 1

$\phi_1 : true \mathcal{U} \mathcal{X} a$ matches to π_1.

$\phi_2 : \mathcal{G} \mathcal{X} a$ matches to π_2.

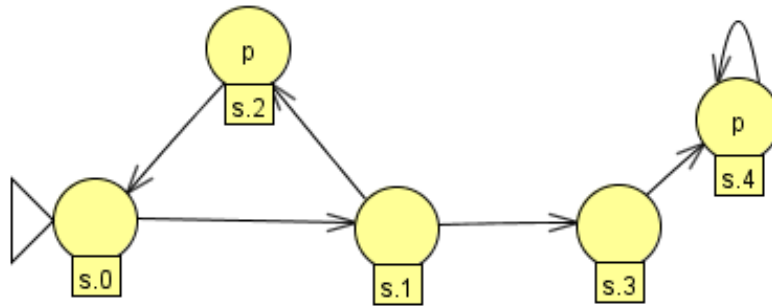$\phi_3 : a \mathcal{U} a$ matches to π_3.

$\phi_4 : a \wedge a$ matches to π_4.

$\phi_5 : \mathcal{F} \mathcal{G} a$ matches to π_5.

$\phi_6 : (\mathcal{X} b) \mathcal{U} a$ matches to π_6.

Aufgabe 2

Counterexample:

While the CTL formulae $AXAFp$ is accepted by the example above. The path $s_0 s_1 s_3$ however is not accepted by the formulae $AFAXp$. Thus $AXAFp$ and $AFAXp$ are not equivalent.

Aufgabe 3

$$\forall s_0 : \mathcal{A} \mathcal{G}(p \rightarrow \mathcal{A} \mathcal{F} q)$$
$$\Leftrightarrow \forall s_0 : \forall \pi = s_0 s_1 ...; \mathcal{G}(p \rightarrow \mathcal{A} \mathcal{F} q)$$
$$\Leftarrow \forall s_0 : \forall \pi = s_0 s_1 ... : \mathcal{G}(\neg p \vee \mathcal{A} \mathcal{F} q)$$
$$\Leftarrow \forall s_0 : \forall \pi = s_0 s_1 ... : \neg \mathcal{F}(p \wedge \neg \mathcal{A} \mathcal{F} q)$$
$$\Leftarrow \forall s_0 : \forall \pi = s_0 s_1 ... : \neg \mathcal{F}(p \wedge \exists \neg \mathcal{F} q)$$
$$\Leftarrow \forall s_0 : \forall \pi = s_0 s_1 ... : \neg \mathcal{F}(p \wedge \neg \mathcal{F} q)$$
$$\Leftarrow \forall s_0 : \forall \pi = s_0 s_1 ... : \mathcal{G}(\neg p \vee \mathcal{F} q)$$
$$\Leftarrow \forall s_0 : \forall \pi = s_0 s_1 ... : \mathcal{G}(p \rightarrow \mathcal{F} q)$$