

1. Olkoon $\mathcal{M} = \langle S, R, v \rangle$, missä

$$\begin{aligned} S &= \{a, b, c, d, e, f\} \\ R &= \{\langle a, b \rangle, \langle b, c \rangle, \langle b, d \rangle, \langle b, e \rangle, \langle c, d \rangle, \langle d, d \rangle, \\ &\quad \langle e, e \rangle, \langle e, f \rangle, \langle f, a \rangle\} \\ \{s \in S \mid v(s, P) = \text{true}\} &= \{a, b, e\} \\ \{s \in S \mid v(s, Q) = \text{true}\} &= \{c, f\} \\ \{s \in S \mid v(s, R) = \text{true}\} &= \{f\} \end{aligned}$$

Olkoon $F = \{R\}$. Tutki, päteekö

- a) $\mathcal{M}, a \models \mathbf{A}(PUQ)$
- b) $\mathcal{M}, a \models_F \mathbf{A}(PUQ)$
- c) $\mathcal{M}, a \models \mathbf{EGP}$
- d) $\mathcal{M}, a \models_F \mathbf{EGP}$

2. Olkoon $\mathcal{M} = \langle S, R, v \rangle$, missä

$$\begin{aligned} S &= \{a, b, c, d, e\} \\ R &= \{\langle a, b \rangle, \langle a, c \rangle, \langle a, d \rangle, \langle b, c \rangle, \langle b, d \rangle, \langle c, a \rangle, \\ &\quad \langle c, e \rangle, \langle d, b \rangle, \langle d, e \rangle, \langle e, b \rangle\} \\ \{s \in S \mid v(s, P) = \text{true}\} &= \{a, b\} \\ \{s \in S \mid v(s, Q) = \text{true}\} &= \{b, c, d\} \end{aligned}$$

Missä tiloissa lause

$$\mathbf{AXE}((P \rightarrow Q)\mathbf{U}(P \wedge Q))$$

on tosi?

3. Olkoon $\mathcal{M} = \langle S, R, v \rangle$, missä

$$S = \{a, b, c, d, e\}$$
$$R = \{\langle a, b \rangle, \langle a, c \rangle, \langle b, d \rangle, \langle d, b \rangle, \langle c, e \rangle, \langle e, c \rangle, \langle d, e \rangle\}$$

$$\{s \in S \mid v(s, P) = \text{true}\} = \{a, c\}$$

$$\{s \in S \mid v(s, Q) = \text{true}\} = \{b, c\}$$

Missä tiloissa lause

$$\mathbf{AG}(Q \rightarrow \mathbf{A}(\mathbf{EFPUAFP}))$$

on tosi?