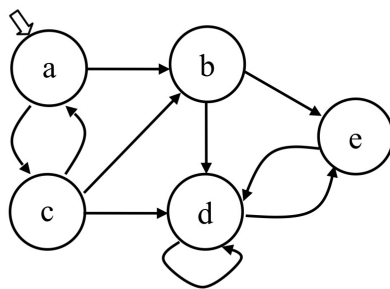1. Given the Kripke structure below, where 'a', 'b', 'c', 'd' and 'e' are atomic propositions and the initial state is denoted with an arrow. Please verify the correctness of the following temporal formulae by the explicit modeling checking technique. Explain why.

(a) AGF (a → X d)

(b) EG (b → AF d)

(c) EFAG !c

(a) $AGF(a \to Xd) \equiv AG[AF(a \to Xd)] \equiv AG[AF(\neg a \lor Xd)]$

∵ The path $a \to c \to a \to c \to \dots$ exists and $a \to Xd$ is false along this path

∴ $AF(a \to Xd)$ is false, and thus $AGF(a \to Xd)$ is false.

(b) $EG(b \to AFd)$: There exists a path that $b \to AFd$ holds globally

$b \to AFd \equiv \neg b \lor AFd$

⇒ $\neg b \lor AFd$ holds globally

⇒ $EG(b \to AFd)$ is true.
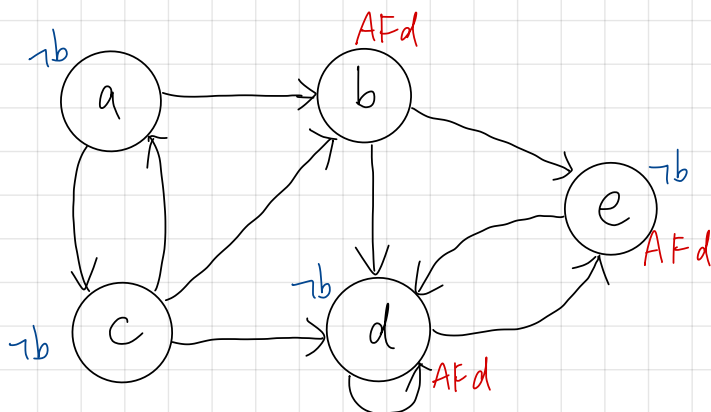
(c) $EFAG!c \equiv EF[AG!c]$

⇒ $AG!c$ holds at state b, d, e

⇒ $EFAG!c$ is true.