Exercise 1

We consider the incomparable expressiveness of CTL and LTL.

(a) Using a theorem from the lecture, prove that there does not exist an equivalent LTL-formula for the CTL-formula $\Phi_1 = \forall \Diamond (a \land \exists \Diamond a)$.

(b) Now prove directly (i.e. without the above theorem), that there does not exist an equivalent LTL-formula for the CTL-formula $\Phi_2 = \forall \exists \Diamond \forall \Diamond \lnot a$.

*Hint: Argument by contraposition, think about trace inclusion vs. CTL-equivalence!*
Exercise 2

Consider the CTL-formula $\Phi = \forall (a \rightarrow \forall (b \land \neg a))$

$$\text{fair} = \Box \forall (a \land \neg b) \rightarrow \Box \forall (b \land \neg a)$$

$$\land \Box \Box b \rightarrow \Box b.$$ 

Check that $TS \models_{\text{fair}} \Phi$!