1 Equivalencies

Prove the following equivalencies by using the formal semantic of the linear temporal logic (LTL):

- $\neg \diamond \phi \equiv \square \neg \phi$
- $\phi \cup \psi \equiv \psi \lor (\phi \land \Diamond(\phi \cup \psi))$
- $\Diamond(\phi \cup \psi) \equiv (\Diamond \phi) \cup (\Diamond \psi)$
- $\Diamond \Box \phi \equiv \Box \Diamond \phi$

2 Formalizing Descriptions

Write LTL formulas for these English specifications. Make sure that a response to a request cannot be issued in the same state that the request is issued first and has to be delayed by at least one step.

- No persisting request will be left unanswered:
- No request will be left unanswered.
- Each request has exactly one answer and there are no overlapping requests.

Come up with LTL formulas for these specifications that seem to reference events from previous steps.

- Every activation should happen immediately after a warning.
- Every activation should be preceded by a dedicated warning.
- Overload signal should indicate uninterrupted action up until that point.