

Constructive Logic (15-317), Fall 2022

Assignment 12: Modal Logic

Constructive Logic Staff
(Instructor: Karl Crary)

Due: Wednesday, December 2, 2022, 11:59 pm

This assignment is coding only, using Dcheck. Please submit a file named “hw.deriv” to “Homework 12.”

You can find documentation on Dcheck at cs.cmu.edu/~crary/dcheck/dcheck.pdf and a sample file at cs.cmu.edu/~crary/dcheck/example.deriv.

1 Modal Logic

Task 1 (30 points). Provide derivations for the following modal logic judgements using Dcheck. Derivation names are given in the starter code.

- a. $\Box T$ true
- b. $\Box A \supset \Diamond \neg A \supset \Diamond F$ true
- c. $(\Box A \wedge \Box B) \supset \Box(A \wedge B)$ true
- d. $\Diamond(\Box A \wedge \Diamond(A \supset B)) \supset \Diamond B$ true
- e. $\Diamond \Box \Diamond A \supset \Diamond A$ true
- f. $\Box A \supset \Diamond(A \supset \Diamond(A \supset B)) \supset \Diamond B$ true

2 Focused Logic Mastery

Task 2 (5 points). Define a derivation named `task2` that derives:

$$\therefore \cdot \xrightarrow{R} (P^+ \wedge^+ \downarrow((P^+ \vee Q^+) \supset \uparrow Q^+)) \supset \downarrow(Q^+ \supset R^-) \supset R^-$$

Instant feedback is turned off for this task, so be extra careful.