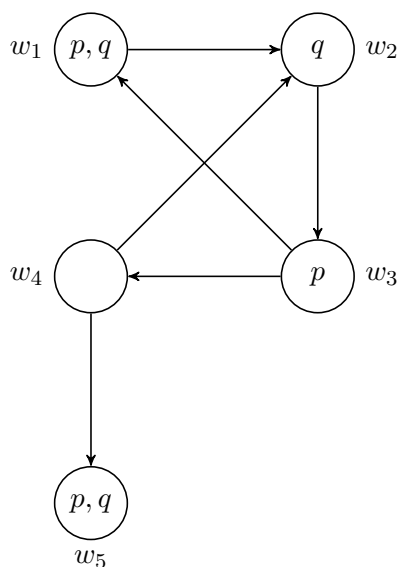


CS112 (Fall 2018) Homework 3
 Modal Logic
 Due October 9, 2018

1. Consider the simple model below, assuming a closed world:



- (a) Does $w_3 \models \Diamond \Box q$? Show why or why not.
- (b) Does $w_4 \models \Box \Box \Diamond p$? Show why or why not.
- (c) Is $\Box p \rightarrow \neg p$ valid in the model? Show why or why not.
- (d) Is $\Diamond(p \vee \neg q) \rightarrow \Box(p \vee \neg q)$ valid in the model? Show why or why not.

2. Exercise 5.2 in Huth and Ryan, page 350:

1. Consider the Kripke model \mathcal{M} depicted in Figure 5.5 (copied below).

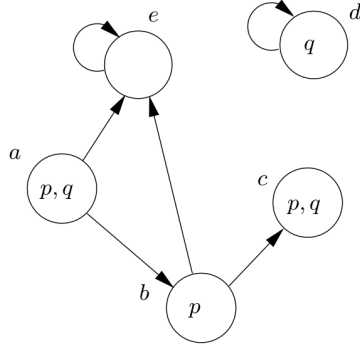


Figure 5.5. Another Kripke model.

- (b) Find for each of the following a world which satisfies it:

- i. $\Box\neg p \wedge \Box\Box\neg p$

- ii. $\Diamond q \wedge \neg\Box q$

- v. $\Box p \vee \Box\neg p$

5. For each of the following pairs of formulas, can you find a model and a world in it which distinguishes them, i.e. makes one of them true and one false? In that case, you are showing that they do not entail each other. If you cannot, it might mean that the formulas are equivalent. Justify your answer.

- (a) $\Box p$ and $\Box\Box p$

- (b) $\Box\neg p$ and $\neg\Diamond p$

- (e) $\Box(p \vee q)$ and $\Box p \vee \Box q$