Amsterdam University College
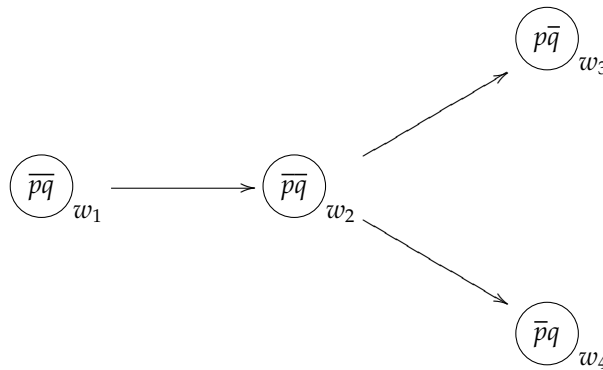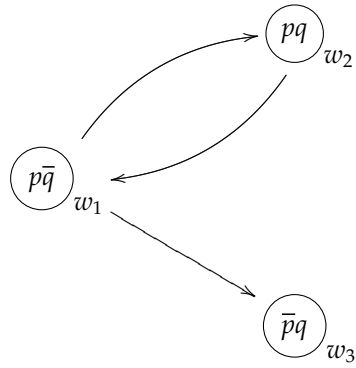
Logic, Information flow and Argumentation

Homework exercises, Week 11, part b (due Tuesday 24 April).

1. Evaluate whether the following modal formulas are true or false in this model (as on the slides: $p, q, \ldots$ signifies that the proposition is true at a node, and $\bar{p}, \bar{q}, \ldots$ signifies that it is not true.)
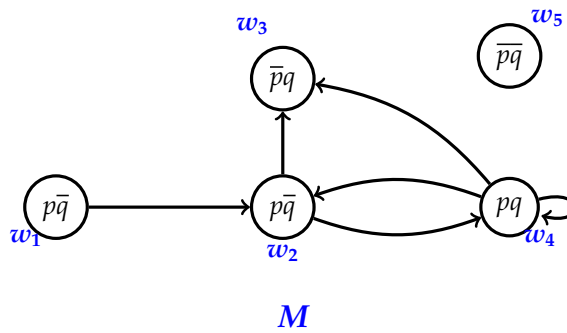
(a) $w_4 \models \Diamond(p \vee \neg p)$

(b) $w_4 \models \neg p \rightarrow \Box q$

(c) $w_3 \models \Box(p \leftrightarrow q)$

(d) $w_3 \models \neg\Diamond(p \rightarrow \neg p) \rightarrow \neg q$

(e) $w_2 \models \neg\Box(p \rightarrow q)$

(f) $w_2 \models \Diamond(\neg p \leftrightarrow \neg q)$

(g) $w_1 \models \neg p \rightarrow \Diamond(q \vee \Diamond(p \wedge \Box q))$

(h) $w_1 \models \Diamond\Box(p \wedge \neg q)$
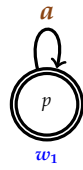
2. Do the same in the following model.

   (a) $w_3 \models q \rightarrow \neg\neg p$

   (b) $w_3 \models \neg\Diamond(p \wedge \neg q)$

   (c) $w_2 \models \Box\neg\Box(p \rightarrow q)$

   (d) $w_2 \models \Diamond\Diamond\neg\Box\neg\Diamond\neg p$

   (e) $w_1 \models \Box\Box(\neg p \wedge \neg q)$

   (f) $w_1 \models q \vee \Box(p \rightarrow \Box\Diamond p)$
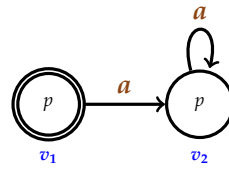
3.

M

For each world in the model, provide **three** formulas that are true only in that world and false in all the others.

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4. Try to answer the following question: is there a modal formula that distinguishes the following two models (i.e., it is true in one but false in the other)?

$$a$$

$$p$$

$$w_1$$

M

$$a$$

$$p \quad a \quad p$$

$$v_1 \quad v_2$$

N