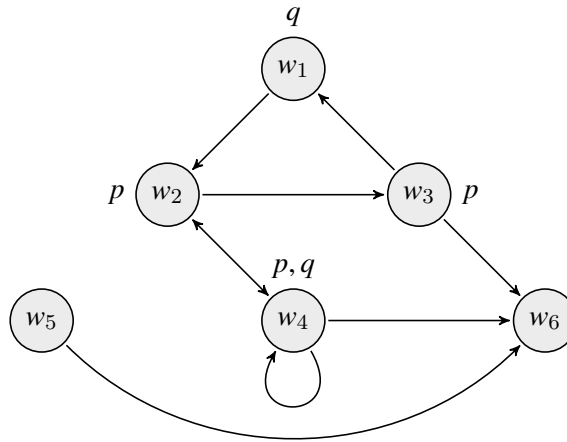


Modal Truth & Bisimulations

Phil 143 Worksheet

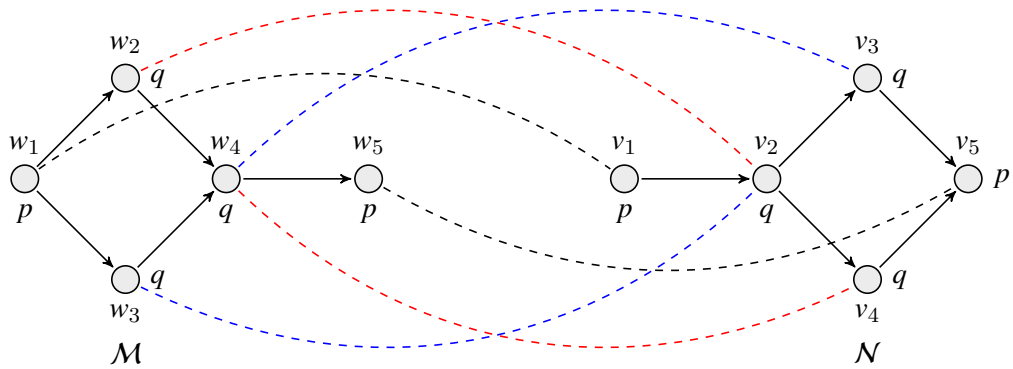
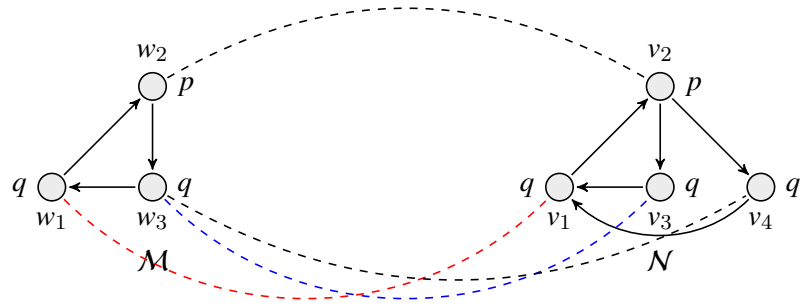
1. Consider the following diagram:



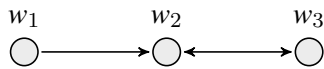
Which states are the following formulas true?

- | | |
|--|--|
| (a) $\Diamond(p \wedge q)$
w_2, w_4 | (j) $\Diamond p$
w_1, w_2, w_4 |
| (b) $\Diamond(p \wedge \neg q)$
w_1, w_2, w_4 | (k) $\Diamond\Diamond p$
w_1, w_2, w_3, w_4 |
| (c) $\Diamond\Diamond(p \wedge q)$
w_1, w_2, w_4 | (l) $\Box\Diamond p$
w_1, w_6 |
| (d) $\Box\Diamond(p \wedge \neg q)$
w_1, w_6 | (m) $\Diamond\Box p$
w_1, w_3, w_4, w_5 |
| (e) $\Box\perp$
w_6 | (n) $\Box\Box p \rightarrow \Box p$
w_1, w_2, w_4, w_6 |
| (f) $\Diamond\Box\perp$
w_3, w_4, w_5 | (o) $\Diamond\Diamond p \rightarrow \Diamond p$
w_1, w_3, w_4, w_5, w_6 |
| (g) $\Diamond\Diamond\Diamond\Box\perp$
w_1, w_2, w_4 | (p) $\Box\Diamond p \rightarrow \Diamond p$
w_1, w_2, w_3, w_4, w_5 |
| (h) $\Box p$
w_1, w_2, w_6 | (q) $\Diamond\Box p \rightarrow \Box p$
w_1, w_2, w_6 |
| (i) $\Box\Box p$
w_1, w_3, w_5, w_6 | (r) $\Box\Diamond p \rightarrow \Diamond\Box p$
w_1, w_2, w_3, w_4, w_5 |

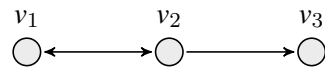
2. Draw a bisimulation between the models \mathcal{M} and \mathcal{N} connecting w_1 and v_1 :



3. Find a formula that w_1 and v_1 disagree on in the models below:



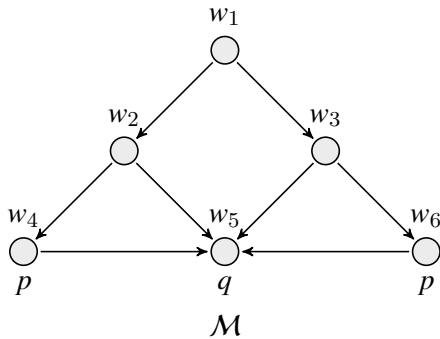
\mathcal{M}



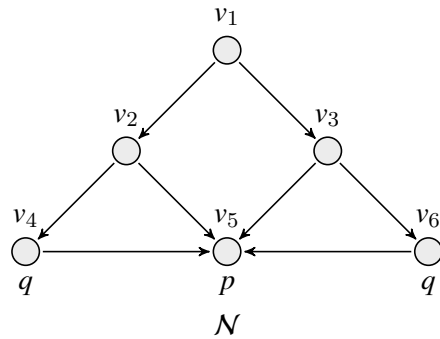
\mathcal{N}

Above: $\mathcal{N}, v_1 \models \diamond\diamond\square\perp$ but $\mathcal{M}, w_1 \not\models \diamond\diamond\square\perp$.

Below: $\mathcal{M}, w_1 \models \diamond\diamond\diamond q$, but $\mathcal{N}, v_1 \not\models \diamond\diamond\diamond q$ (reversed for $\diamond\diamond\diamond p$).



\mathcal{M}



\mathcal{N}