Initial set of clauses $S_0$:

1. $P \lor Q \lor R$
2. $P \lor \neg Q \lor \neg R$
3. $P \lor \neg W$
4. $\neg Q \lor \neg R \lor \neg W$
5. $\neg P \lor \neg Q \lor R$
6. $U \lor X$
7. $U \lor \neg X$
8. $Q \lor \neg U$
9. $\neg R \lor \neg U$

Initial valuation $V_0$: All atoms unbound.

Sequence of calls.

I. Call $dp_1(ATOMS, S_0, V_0)$

$\neg W$ is a pure literal. ($W$ never appears) $V_1[W] = \text{FALSE}$.

New set of clauses $S_1$: Delete clauses 3 and 4 (satisfied)

1. $P \lor Q \lor R$
2. $P \lor \neg Q \lor \neg R$
5. $\neg P \lor \neg Q \lor R$
6. $U \lor X$
7. $U \lor \neg X$
8. $Q \lor \neg U$
9. $\neg R \lor \neg U$

No pure literals, no singleton clauses.

Try $V[P] := \text{TRUE}$; $V_2$ is the valuation $V_2[P] = \text{TRUE}$, $V_2[W] = \text{FALSE}$.

Call propagate($P, S_1, V_2$): Delete clauses 1 and 2, delete $\neg P$ from 5

New set of clauses $S_2$:

5. $\neg Q \lor R$
6. $U \lor X$
7. $U \lor \neg X$
8. $Q \lor \neg U$
9. $\neg R \lor \neg U$.

II. Call $dp_1(ATOMS, S_2, V_2)$.

No pure literals, no singleton clauses.

Try $V[Q] := \text{TRUE}$; $V_3$ is the valuation $V_3[P] = \text{TRUE}$, $V_3[Q] = \text{TRUE}$, $V_3[W] = \text{FALSE}$.

Call propagate($P, S_2, V_3$): Delete clause 8, delete $\neg Q$ from 5

New set of clauses $S_3$:

5. $R$
6. $U \lor X$
7. $U \lor \neg X$
9. $\neg R \lor \neg U$.

III. Call $dp_1(ATOMS, S_3, V_3)$.

5 is a singleton clause with literal $R$;
$V[R] = \text{TRUE}$;
Call propagate(P,S3,V4): Delete clause 5, delete ¬R from clause 9.
New set of clauses S4:
   6. U ∨ X
   7. U ∨ ¬X
   9. ¬U.

9 is a singleton clause with literal ¬U;
V[U] = FALSE;
Call propagate(P,S4,V5): Delete clause 9, delete U from clauses 6 and 7.
New set of clauses S5:
   6. X
   7. ¬X

6 is a singleton clause with literal X;
V[X] = FALSE;
Call propagate(P,S5,V6): Delete clause 6, delete ¬X from clause 7.
New set of clauses S6:
   7. empty

7 is the empty clause.
III returns NIL to II.

II continuing.
Try V[Q] := FALSE; V7 is the valuation V7[P] = TRUE, V7[Q] = FALSE, V7[W] = FALSE.
Call propagate(P,S2,V7): Delete clause 5, delete Q from 8
New set of clauses S7:
   6. U ∨ X
   7. U ∨ ¬X
   8. ¬U
   9. ¬R ∨ ¬U.

IV. Call dp1(ATOMS, S7, V7).
8 is a singleton clause with literal ¬U;
V[U] = TRUE;
Call propagate(P,S7,V8): Delete clauses 8 and 9, delete U from clauses 6 and 7.
New set of clauses S9:
   6. X
   7. ¬X

6 is a singleton clause with literal X;
V[X] = TRUE;
Call propagate(P,S8,V9): Delete clause 6, delete ¬X from clause 7.
New set of clauses S9:
   7. empty
7 is the empty clause.
IV returns NIL to II.

II having failed with both TRUE and FALSE for Q, returns NIL to I.

I continuing
Try \( V[P] := \text{FALSE} \); \( V_{10} \) is the valuation \( V_{10}[P] = \text{TRUE}, V_{10}[W] = \text{FALSE} \).
Call \( \text{propagate}(P,S_2,V_{10}) \): Delete clause 5, delete \( P \) from 1 and 2
New set of clauses \( S_{10} \):
\[
\begin{align*}
1. & \; Q \lor R \\
2. & \; \neg Q \lor \neg R \\
6. & \; U \lor X \\
7. & \; U \lor \neg X \\
8. & \; Q \lor \neg U \\
9. & \; \neg R \lor \neg U.
\end{align*}
\]

V. Call \( \text{dp1}(\text{ATOMS}, S_{10}, V_{10}) \).
No pure literals, no singleton clauses.
Try \( V[Q] := \text{TRUE} \); \( V_{11} \) is the valuation \( V_{11}[P] = \text{FALSE}, V_{11}[Q] = \text{TRUE}, V_{11}[W] = \text{FALSE} \).
Call \( \text{propagate}(P,S_{10},V_{11}) \): Delete clauses 1 and 8, delete \( \neg Q \) from 2
New set of clauses \( S_{11} \):
\[
\begin{align*}
2. & \; \neg R \\
6. & \; U \lor X \\
7. & \; U \lor \neg X \\
9. & \; \neg R \lor \neg U.
\end{align*}
\]

VI. Call \( \text{dp1}(\text{ATOMS}, S_{11}, V_{11}) \).
\( \neg R \) is a pure literal.
\( V[R] := \text{FALSE} \); \( V_{12} \) is the valuation \( V_{12}[P] = \text{FALSE}, V_{12}[Q] = \text{TRUE}, V_{12}[R] = \text{FALSE}, V_{12}[W] = \text{FALSE} \).
Delete clauses 2 and 9.
New set of clauses \( S_{12} \):
\[
\begin{align*}
6. & \; U \lor X \\
7. & \; U \lor \neg X
\end{align*}
\]
U is a pure literal.
\( V[U] := \text{TRUE} \); \( V_{13} \) is the valuation \( V_{13}[P] = \text{FALSE}, V_{13}[Q] = \text{TRUE}, V_{13}[R] = \text{FALSE}, V_{13}[U] = \text{TRUE}, V_{13}[W] = \text{FALSE} \).
Delete clauses 6 and 7.
\( S_{13} \) is the empty set of clauses.
Set the value of atom X to be either TRUE or FALSE.
Return \( V_{13} \) to the top level.