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 \(dp1(ATOMS, S_0, V_0)\)

\(\neg W\) 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 \(dp1(ATOMS, S_2, V_2)\).

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(\(Q, S_2, V_3\)): 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 \(dp1(ATOMS, S_3, V_3)\).

5 is a singleton clause with literal \(R;\)

\(V[R] = \text{TRUE};\)
Call propagate(R, 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(U, 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] = TRUE;
V6 is the valuation V6[P] = TRUE, V6[Q] = TRUE, V6[R] = TRUE,
Call propagate(X, 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(Q, 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] = FALSE;
Call propagate(U, 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;
  V9[X] = TRUE, V9[W] = FALSE.
Call propagate(X, 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 \( V[P] := \text{FALSE} \); \( V10 \) is the valuation \( V10[P] = \text{FALSE}, V10[W] = \text{FALSE} \).
Call propagate(P,S1,V10): Delete clause 5, delete \( P \) from 1 and 2
New set of clauses \( S10 \):
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. \( \neg R \lor \neg U \).

V. Call dp1(ATOMS, S10, V10).
No pure literals, no singleton clauses.
Try \( V[Q] := \text{TRUE} \); \( V11 \) is the valuation \( V11[P] = \text{FALSE}, V11[Q] = \text{TRUE}, V11[W] = \text{FALSE} \).
Call propagate(Q,S10,V11): Delete clauses 1 and 8, delete \( \neg Q \) from 2
New set of clauses \( S11 \):
2. \( \neg R \)
6. \( U \lor X \)
7. \( U \lor \neg X \)
9. \( \neg R \lor \neg U \).

VI. Call dp1(ATOMS, S11, V11).
\( \neg R \) is a pure literal.
\( V[R] := \text{FALSE} \); \( V12 \) is the valuation \( V12[P] = \text{FALSE}, V12[Q] = \text{TRUE}, V12[R] = \text{FALSE}, V12[W] = \text{FALSE} \).
Delete clauses 2 and 9.
New set of clauses \( S12 \):
6. \( U \lor X \)
7. \( U \lor \neg X \)
\( U \) is a pure literal.
Delete clauses 6 and 7.
\( S13 \) is the empty set of clauses.

Set the value of atom \( X \) to be either TRUE or FALSE.
Return \( V13 \) to the top level.