# Setting up Truth Trees to check for semantic properties other than consistency:

Check if **P** is a Tautology:

1. **~P** SM

If and only if the tree for {**~P**} closes, **P** is a tautology.

Check if **P** is a Contradiction:

1. **P** SM

If and only if the tree for {**P**} closes, **P** is a contradiction.

Check if **P** is Contingent:

If and only if neither the tree for {**P**} nor for {**~P**} closes, **P** is contingent.

Check for Equivalence of **P** and **Q**:

1. **~(P ≡ Q)** SM

If and only if the tree for {**~(P ≡ Q)**} closes, P and Q are truth-functionally equivalent.

Check whether {**P**, **Q**, **R**} Entails **S**:

1. **P** SM
2. **Q** SM
3. **R** SM
4. **~S** SM

If and only if the tree for {**P**, **Q**, **R, ~S**} closes, then {**P**, **Q**, **R**} entails **S**.

Check whether the argument below is Valid:

P1: **P**
P2: **Q**
P3: **R**
C: **S**

1. **P** SM
2. **Q** SM
3. **R** SM
4. **~S** SM

If and only if the tree for {**P**, **Q**, **R, ~S**} closes, the argument above is valid