Solutions

2.1

- Backward chaining: it starts at the query ✓.

2.2

- Modus ponens: from $P \to Q$ and P, conclude Q ✓.

2.3

- Reading $P \to Q$ as licensing $Q \to P$ ✓.

3.1

- Wave one: Delayed (R1 from Storm; R3 unused until HeavyTraffic); HeavyTraffic needs Weekend – F3 says false, so R2 never fires ✓.
- Wave two: RefundRisk (R4) and Compensated (R5) ✓.
- Wave three: nothing new – closure ✓.
- Backward for Compensated: goal ← Delayed (R5) ← Storm (R1) ← fact F1: three steps ✓.
- Total derived facts at closure: Storm, Weekend(false), Delayed, RefundRisk, Compensated – three derived truths plus the two base facts ✓.

3.2

- Assumption: ¬RefundRisk ✓.
- Contrapositive of R4: ¬RefundRisk → ¬Delayed; with the derived Delayed, resolution gives a contradiction; F1 (Storm) closes the other branch via R1 ✓.
- Shorter here: the forward chain already has RefundRisk at wave two – refutation pays when the query is deep and rules are many ✓.
- Solver family: SAT solvers (resolution-based), the same machinery as unit 10's NP chain ✓.