Coq Tactic Quick Reference

Context Manipulation

- **intro/revert**: shift goal premises to/from context
- **rename**: rename a hypothesis in the context
- **clear**: drop a hypothesis from the context
- **assert**: add a hypothesis to the context (proving it first)

Theorems and Assumptions

- **assumption**: goal is identical to a hypothesis
- **apply**: use theorem $A \rightarrow B$ to reduce goal $B$ to subgoal $A$, or convert hypothesis $A$ to hypothesis $B$

Simplification

- **simpl**: evaluate expressions until no more progress is possible
- **unfold**: expand an identifier into its definition
- **fold**: contract a definition back to its identifier

Equalities

- **reflexivity**: prove equality of two identical expressions
- **symmetry**: change $e_1 = e_2$ to $e_2 = e_1$
- **transitivity**: reduce goal $e_1 = e_2$ to two subgoals $e_1 = e$ and $e = e_2$
- **rewrite**: use hypothesis $e_1 = e_2$ to replace $e_1$ with $e_2$ or vice versa
- **subst**: use and clear hypothesis $v = e$ by replacing all $v$’s with $e$’s
- **inversion**: from equality of structures, infer equality of substructures
- **remember**: introduce a new variable that names a subexpression

Logical Operators

- **split**: prove $A \land B$ by proving $A$ and $B$
- **left/right**: prove $A \lor B$ by proving $A$ (left) or $B$ (right)
- **exists**: prove an existential by supplying a witness
- **destruct**: decompose an and/or/exists hypothesis or pair variable
- **specialize**: instantiate a forall hypothesis

Case Distinction and Induction

- **destruct**: introduce separate cases for each possible constructor
- **induction**: same as destruct, but generate an inductive hypothesis
- **inversion**: perform case distinction on an inductive proposition

Negation and Contradiction

- **discriminate**: eliminate goal that falsely assumes equality of distinct constructors
- **exfalso**: replace a goal with False