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 $A \to B$ 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
- injection: from equality of structures, infer equality of substructures
- remember: introduce a new variable that names a subexpression

Logical Operators

- split: prove $A \wedge B$ by proving A and B
- left/right: prove $A \vee B$ 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: drop a goal by identifying a contradictory hypothesis
- exfalso: drop a goal by proving False