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
- injection: 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: drop a goal by identifying a contradictory hypothesis
- exfalso: drop a goal by proving False