Coq Proof Tactics Cheat Sheet

**Context Manipulation**
- `intro/revert` - shift goal premises to/from context
- `rename` - rename an assumption in the context
- `clear` - clear an assumption from the context
- `assert` - add an assumption to the context (proving it first)

**Applying Theorems and Assumptions**
- `assumption` - goal is equivalent to one of the assumptions
- `apply` - use theorem A→B to reduce goal B to subgoal A or convert assumption A to assumption B

**Term Simplification**
- `simpl` - expand definitions until no more progress is possible
- `unfold` - expand an identifier to its definition
- `fold` - contract an expansion back to its identifier

**Dealing with Equalities**
- `reflexivity` - goal is an equality of two equivalent expressions
- `symmetry` - swap goal "e1=e2" to "e2=e1"
- `transitivity` - reduce goal "e1=e2" to subgoals "e1=e" and "e=e2"
- `rewrite` - use assumption "e1=e2" to substitute e1 with e2 (or vice versa)
- `subst` - use and clear assumption "v=e" by replacing all v's with e
- `injection` - from equality of structures, infer equality of substructures
- `remember` - introduce a new variable that names a subexpression

**Logical Operators (and/or/exists/forall)**
- `split` - prove goal A\B by proving subgoals A and B
- `left/right` - prove A\B by proving A (left) or proving B (right)
- `exists` - prove an existential goal by supplying a witness
- `destruct` - decompose an and/or/exists assumption, or a pair variable
- `specialize` - instantiate a forall assumption

**Case Distinction and Induction**
- `destruct` - introduce one case for each of a term's possible constructors
- `induction` - same as destruct, but generate an inductive hypothesis
- `inversion` - perform a case-distinction on an inductive proof object

**Negation and Contradiction**
- `discriminate` - solve a goal by recognizing an impossible equality assumption
- `exfalso` - solve a goal by proving that False is provable