CIS 554: Conversion to Clause Form

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These rules are adapted from *Artificial Intelligence*, by Elaine Rich and Kevin Knight.

1. Eliminate logical implications, ⇒, using the fact that `A ⇒ B` is equivalent to `¬A ∨ B`.
2. Reduce the scope of each negation to a single term, using the following facts:

```
¬(¬P) = P
¬(A ∨ B) = ¬A ∧ ¬B
¬(A ∧ B) = ¬A ∨ ¬B
¬∀x: P(x) = ∃x: ¬P(x)
¬∃x: P(x) = ∀x: ¬P(x)
```

3. Standardize variables so that each quantifier binds a unique variable.
4. Move all quantifiers to the left, maintaining their order.
5. Eliminate existential quantifiers, using Skolem functions (functions of the preceding universally quantified variables). Examples:

```
∃x: P(x) becomes x'
∀x: ∃y: P(y) becomes ∀x: y'(x)
```

6. Drop the prefix; assume universal quantification.
   Note: The term *prefix* refers to all the quantifiers; the *matrix* is everything else.
7. Convert the matrix into a conjunction of disjuncts.
8. Create a separate clause corresponding to each conjunct.
9. Standardize apart the variables in the clauses.