A. Symbolize, taking the domain of quantification to be persons, and using:

$Sx \equiv x$ is a soprano. $Tx \equiv x$ is a tenor.
$Lxy \equiv x$ is louder than y. $Rxy \equiv x$ respects y.

1. No tenor who is louder than all sopranos respects any soprano.
2. A tenor who is louder than some soprano is also louder than some tenor.
3. There are sopranos who respect only those tenors who are louder than they.
4. If a tenor respects all sopranos who respect him, then that tenor is respected by all sopranos.

B. Symbolize, taking the domain of discourse to be persons, and using *only* the following vocabulary:

$Pxy \equiv x$ is a parent of y $Mx \equiv x$ is male $Ixy \equiv x$ is identical to y
$Txy \equiv x$ is taller than y

1. x and y are first cousins.
2. x has at most two daughters.
3. x has (exactly) two grandfathers.
4. x is the tallest child of y.

C.

1. Show that there is a sentence of propositional logic that is not logically equivalent to any sentence whose only connective is "$\rightarrow$". (Hint: Use proof by induction.)
2. Show that the inference rule $\vee$-Elimination is sound; that is, if line n results from lines i, j, k, l, m by $\vee$-Elimination, and lines i, k, m are "good", then line n is good. (Definition: A line is **good** if the sentence to the right of the line number is a semantic consequence of the sentences on the dependency lines. A sentence B is a **semantic consequence** of sentences $A_1, \ldots, A_n$ if: for any valuation v, if v assigns true to $A_1, \ldots, A_n$ then v assigns true to B. We denote this by $A_1, \ldots, A_n \models B$. A propositional logic **valuation** is an assignment of truth values to sentences that obeys the truth-table relationships.)