(1) Bring the negation “as far inside as possible.”
\[ \neg[(\neg A \land \neg \neg B) \lor \neg(A \lor C)]. \]

(2) Write the (a) converse and (b) contrapositive of the following statement
\[ (A \land B) \Rightarrow (C \lor (\neg D \land E)). \]

(3) Write the contrapositive of the following statement using \( \forall, \exists, \) etc.
If \( A \) has a largest element, then every element of \( A \) is a rational number.

(4) Show that for every \( n \in \mathbb{N} \), \( 5^{2n} - 1 \) is a multiple of 8.
(5) Suppose $S \subset \mathbb{R}$ and $x$ is a real number such that (a) $x$ is a lower bound of $S$, and 
(b) $\forall \varepsilon > 0$, $\exists s \in S \ [s < x + \varepsilon]$. Prove that $x = \inf S$ iff both (a) and (b) hold.

(6) Prove the following theorem: For all real numbers $x$ and $y$ such that $x < y$, there is a rational number $r$ such that $x < r < y$.

(7) Prove the following theorem: If $|x| < 1$, then $\lim x^n = 0$.

(8) Prove the following theorem (prove all parts independently): Suppose $\lim s_n = L_1$, and $\lim t_n = L_2$ and $c \in \mathbb{R}$. Then

(a) $\lim (s_n + t_n) = L_1 + L_2$
(b) $\lim cs_n = cL_1$
(c) $\lim s_nt_n = L_1L_2$