1. (5 points) Check all the statements that are equal to \( p \implies (q \lor r) \) (in this question only the answers will be graded.)

- \( (p \lor q) \implies \neg q \land r \)
- \( (p \land q \land r) \iff q \land r \)
- \( \neg p \land (q \lor r) \)
2. (5 points) Consider a set $G$ equipped with an operation $\cdot$ on the elements of $G$ which satisfy the following axioms:

1. For any $a, b, c \in G$, $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.

2. There is a unique $e \in G$ such that for any $a \in G$, $e \cdot a = a = a \cdot e$ (such an element is called the identity element).

3. For every $a \in G$ there exists $b \in G$ such that $a \cdot b = e$, where $e$ is the identity element.

4. For every $a \in G$ there exists $b \in G$ such that $b \cdot a = e$, where $e$ is the identity element.

Let $e$ be the identity element. Show that if $a \cdot b = e$, then $b \cdot a = e$. 
3. (5 points) For an integer $n$ define $n!$ as follows: $1! = 1$ and $n! = (n - 1)! \cdot n$. Show that $n! \geq 2^n$ for any $n \geq 4$. 
4. (5 points) Show that there does not exist a largest integer.