1. Find an example of a sequence that satisfies the below statements and then write the below statements using logical notation:
   (a) For every $\epsilon > 0$ there *are infinitely many* n such that distance of a_n to 0 is less than ϵ.
   (b) For every $\epsilon > 0$ *for all but finitely many* n the distance of a_n to 0 is less than ϵ.
   (c) For every $\epsilon > 0$, all but finitely many elements of the sequence a_n are above $11 + \epsilon$ and all but finitely many element are below $5 - \epsilon$.
2. Provide two examples (if any) of sequences $\{a_n\}$ that satisfy each of the statements below.
   (a) A sequence that converges to 0 which has the property that infinitely many elements are negative numbers and infinitely many elements are positive numbers.
   (b) A non-constant sequence that does not converge.
   (c) For all $\epsilon > 0$, there are infinitely many $n \in \mathbb{N}$ such that
   $$| a_n - L |< \epsilon$$
   for $L = -1, 0, 3$ and $a_n \notin \{-1, 0, 3\}$ for infinitely many $n \in \mathbb{N}$.
   (d) A sequence that converges to 0 which has the property that all but finitely many elements are negative.
   (e) For all $\epsilon > 0$, for all but finitely many $n \in \mathbb{N}$ $a_n < 5 + \epsilon$ and $a_n > -11 - \epsilon$.
   (f) For all $M > 0$:
   there are infinitely many $n \in \mathbb{N}$ such that $a_n > M$ and
   there are infinitely many $n \in \mathbb{N}$ such that $a_n < -M$.
3. If $f : \mathbb{R} \to \mathbb{R}$ is unbounded then construct a sequence $\{a_n\}$ such that $\lim_{n\to\infty} | f(a_n) |= \infty$
4. It is important to understand the logical implication of ($P \implies Q$ along with the operations of the *Converse* ($Q \implies P$), the *Contrapositive* ($\neg Q \implies \neg P$) and the negated implication $\neg P(\implies Q)$. Please fill in the truth table below to illustrate the differences between these operations:

P	Q	$P \implies Q$	$Q \implies P$	$\neg Q \implies \neg P$	$\neg(P \iff Q)$
T	T				
T	F				
F	T				
F	F				