Conjecture: If the sequence $\{a_n\}_{n=1}^{\infty}$ tends to limit L as $n \to \infty$. then for any fixed number $M > 0$, the sequence $\{Ma_n\}_{n=1}^{\infty}$ tends to the limit ML.

Since $\{a_n\}_{n=1}^{\infty} \to L$ as $n \to \infty$, by the definition of the limit for all $\delta > 0$ there exists $N \in \mathcal{N}$ such that $|a_n - L| < \delta$ for $n > N$.

For any $\epsilon > 0$, we can choose $\epsilon = M\delta$. So, $|a_n - L| < \epsilon/M$ for some fixed M. Then for some $n > N$,

$$|Ma_n - ML| = M|a_n - L| < M\frac{\epsilon}{M} = \epsilon \qquad (1)$$

By definition this means that $\{Ma_n\}_{n=1}^{\infty} \to ML$ as $n \to \infty$ and the conjecture is true.